LG

RH-7500/B

MODEL

SERVICE MANUAL

SECTION 1

SUMMARY

CONTENTS

NEW FUNCTIONS OF HDD/DVD-RECORDER

• HDMI

HDMI IS THE SPECIFICATION FOR THE HIGH-DEFINITION MULTIMEDIA INTERFACE. HDMI IS PROVIDED FOR TRANSMITTING DIGITAL TELEVISION AUDIOVISUAL SIGNALS FROM HDD-DVD RECORDER TO TELEVISION SETS, OTHER VIDEO DISPLAYS. HDMI CAN CARRY HIGH QUALITY MULTI-CHANNEL AUDIO DATA AND CAN CARRY ALL STANDARD AND HIGH DEFINITION CONSUMER ELECTRONICS VIDEO FORMATS. CONTENT PROTECTION TECHNOLOGY IS AVAILABLE. HDMI CAN ALSO CARRY CONTROL AND STATUS INFORMATION IN BOTH DIRECTIONS.

<< OPERATING >>

AUDIO, VIDEO AND AUXILIARY DATA IS TRANSMITTED ACROSS THE THREE TMDS DATA CHANNELS.

THE VIDEO PIXEL CLOCK IS TRANSMITTED ON THE TMDS CLOCK CHANNEL AND IS USED BY THE RECEIVER AS A FREQUENCY REFERENCE FOR DATA RECOVERY ON THE THREE TMDS DATA CHANNELS.

VIDEO DATA IS CARRIED AS A SERIES OF 24-BIT PIXELS ON THE THREE TMDS DATA CHANNELS.

TMDS ENCODING CONVERTS THE 8BIT PER CHANNEL INTO THE 10BIT DC–BALANCED.

VIDEO PIXEL RATES CAN RANGE FROM 25MHZ TO 165MHZ. THE VIDEO PIXELS CAN BE ENCODED IN EITHER RGB,YCBCR 4:4:4 OR YCBCR 4:2:2 FORMATS. IN ALL THREE CASES, UP TP 24 BITS PER PIXEL CAN BE TRANSFERRED.

FAST DUBBING

DUBBING MEANS A COPYING FUNCTION BETWEEN HDD TO DVD DISCS.

COPYING BETWEEN HDD TO DVD IS A COMPLETELY DIGITAL PROCESS AND THEREFORE INVOLVES NO LOSS OF QUALITY IN THE AUDIO OR VIDEO. SO THIS MEANS THAT COPYING CAN BE CARRIED OUT AT THE MAXIMUM SPEED POSSIBLE.

<< DUBBING SPEED RATE >>

NORMAL DUBBING : SPEED RATE MAX X1
FAST DUBBING : SPEED RATE MAX X4

WHEN FAST DUBBING FROM HDD TO DVD , THE SPEED OF COPYING DEPENDS ON THE RECORDING MODE AND THE KIND OF USING THE DVD DISC, AND THIS MODE IS NOT AVAILABLE FOR EDITED VIDEO TITLE IN HDD.

WHEN FAST DUBBING FROM DVD TO HDD , ONLY AVAILABLE WHEN COPYING VR MODE DISC(DVD-RW) TO HDD , AND ONLY NORMAL DUBBING AVAILABLE WHEN COPYING VIDEO MODE DISC (DVD+R/RW, DVD-R) TO HDD

PRODUCT SAFETY SERVICING GUIDELINES FOR VIDEO PRODUCTS

IMPORTANT SAFETY NOTICE

This manual was prepared for use only by properly trained audio-video service technicians.

When servicing this product, under no circumstances should the original design be modified or altered without permission from LG Electronics Corporation. All components should be replaced only with types identical to those in the original circuit and their physical location, wiring and lead dress must conform to original layout upon completion of repairs.

Special components are also used to prevent x-radiation, shock and fire hazard. These components are indicated by the letter “x” included in their component designators and are required to maintain safe performance. No deviations are allowed without prior approval by LG Electronics Corporation.

Circuit diagrams may occasionally differ from the actual circuit used. This way, implementation of the latest safety and performance improvement changes into the set is not delayed until the new service literature is printed.

CAUTION: Do not attempt to modify this product in any way. Never perform customized installations without manufacturer’s approval. Unauthorized modifications will not only void the warranty, but may lead to property damage or user injury.

Service work should be performed only after you are thoroughly familiar with these safety checks and servicing guidelines.

GRAPHIC SYMBOLS

The exclamation point within an equilateral triangle is intended to alert the service personnel to important safety information in the service literature.

The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the service personnel to the presence of noninsulated “dangerous voltage” that may be of sufficient magnitude to constitute a risk of electric shock.

The pictorial representation of a fuse and its rating within an equilateral triangle is intended to convey to the service personnel the following fuse replacement caution notice:

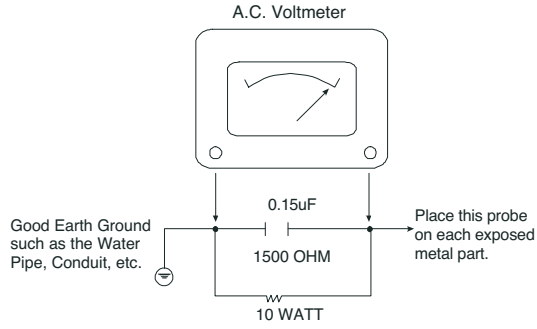
CAUTION: FOR CONTINUED PROTECTION AGAINST RISK OF FIRE, REPLACE ALL FUSES WITH THE SAME TYPE AND RATING AS MARKED NEAR EACH FUSE.

SERVICE INFORMATION

While servicing, use an isolation transformer for protection from AC line shock. After the original service problem has been corrected, make a check of the following:

FIRE AND SHOCK HAZARD

1. Be sure that all components are positioned to avoid a possibility of adjacent component shorts. This is especially important on items trans-ported to and from the repair shop.
2. Verify that all protective devices such as insulators, barriers, covers, shields, strain reliefs, power supply cords, and other hardware have been reinstalled per the original design. Be sure that the safety purpose of the polarized line plug has not been defeated.
3. Soldering must be inspected to discover possible cold solder joints, solder splashes, or sharp solder points. Be certain to remove all loose foreign particles.
4. Check for physical evidence of damage or deterioration to parts and components, for frayed leads or damaged insulation (including the AC cord), and replace if necessary.
5. No lead or component should touch a high current device or a resistor rated at 1 watt or more. Lead tension around protruding metal surfaces must be avoided.
6. After reassembly of the set, always perform an AC leakage test on all exposed metallic parts of the cabinet (the channel selector knobs, antenna terminals, handle and screws) to be sure that set is safe to operate without danger of electrical shock. DO NOT USE A LINE ISOLATION TRANSFORMER DURING THIS TEST. Use an AC voltmeter having 5000 ohms per volt or more sensitivity in the following manner: Connect a 1500 ohm, 10 watt resistor, paralleled by a .15 mfd 150V AC type capacitor between a known good earth ground water pipe, conduit, etc.) and the exposed metallic parts, one at a time. Measure the AC voltage across the combination of 1500 ohm resistor and .15 mfd capacitor. Reverse the AC plug by using a non-polarized adaptor and repeat AC voltage measurements for each exposed metallic part. Voltage measured must not exceed 0.75 volts RMS. This corresponds to 0.5 milliamp AC. Any value exceeding this limit constitutes a potential shock hazard and must be corrected immediately.



TIPS ON PROPER INSTALLATION

1. Never install any receiver in a closed-in recess, cubbyhole, or closely fitting shelf space over, or close to, a heat duct, or in the path of heated air flow.
2. Avoid conditions of high humidity such as: outdoor patio installations where dew is a factor, near steam radiators where steam leakage is a factor, etc.
3. Avoid placement where draperies may obstruct venting. The customer should also avoid the use of decorative scarves or other coverings that might obstruct ventilation.
4. Wall- and shelf-mounted installations using a commercial mounting kit must follow the factory-approved mounting instructions. A product mounted to a shelf or platform must retain its original feet (or the equivalent thickness in spacers) to provide adequate air flow across the bottom. Bolts or screws used for fasteners must not touch any parts or wiring. Perform leakage tests on customized installations.
5. Caution customers against mounting a product on a sloping shelf or in a tilted position, unless the receiver is properly secured.
6. A product on a roll-about cart should be stable in its mounting to the cart. Caution the customer on the hazards of trying to roll a cart with small casters across thresholds or deep pile carpets.
7. Caution customers against using extension cords. Explain that a forest of extensions, sprouting from a single outlet, can lead to disastrous consequences to home and family.

SERVICING PRECAUTIONS

CAUTION : Before servicing the HDD/DVD Recorder covered by this service data and its supplements and addends, read and follow the SAFETY PRECAUTIONS. NOTE : if unforeseen circumstances create conflict between the following servicing precautions and any of the safety precautions in this publications, always follow the safety precautions.
Remembers Safety First:

General Servicing Precautions

1. Always unplug the HDD/DVD Recorder AC power cord from the AC power source before:
   (1) Removing or reinstalling any component, circuit board, module, or any other assembly.
   (2) Disconnection or reconnecting any internal electrical plug or other electrical connection.
   (3) Connecting a test substitute in parallel with an electrolytic capacitor.
   Caution : A wrong part substitution or incorrect polarity installation of electrolytic capacitors may result in an explosion hazard.

2. Do not spray chemicals on or near this HDD/DVD Recorder or any of its assemblies.

3. Unless specified otherwise in this service data, clean electrical contacts by applying an appropriate contact cleaning solution to the contacts with a pipe cleaner, cotton-tipped swab, or comparable soft applicator.
   Unless specified otherwise in this service data, lubrication of contacts is not required.

4. Do not defeat any plug/socket B+ voltage interlocks with whitch instruments covered by this service manual might be equipped.

5. Do not apply AC power to this HDD/DVD Recorder and/or any of its electrical assemblies unless all solid-state device heat sinks are cerrectly installed.

6. Always connect test instrument ground lead to the appropriate ground before connection the test instrument positive lead. Always remove the test instrument ground lead last.

Insulation Checking Procedure

Disconnect the attachment plug from the AC outlet and turn the power on. Connect an insulation resistance meter(500V) to the blades of the attachment plug. The insulation resistance between each blade of the attachment plug and accessible conductive parts (Note 1) should be more than 1M-ohm.
Note 1 : Accessible Conductive Parts including Metal panels, Input terminals, Earphone jacks, etc.

Electrostatically Sensitive (ES) Devices

Some semiconductor (solid state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive (ES) Devices. Examples of typical ES devices are integrated circuits and some field effect transistors and semiconductor chip components.
The following techniques should be used to help reduce the incidence of component damage caused by static electricity.

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed for potential shock reasons prior to applying power to the unit under test.

2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.

3. Use only a grouned-tip soldering iron to solder or unsolder ES devices.

4. Use only an anti-static solder removal device. Some solder removal devices not classified a “anti-static” can generate electrical charges sufficient to damage ES devices.

5. Do not use freon-propelled chemicals. These can generate electrical charge sufficient to damage ES devices.

6. Do not remove a replacement ES device from its protec tive package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil, or comparable conductive material).

7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.

   Caution : Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.

8. Minimize bodily motions when handling unpackaged replacement ES devices. (Normally harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device.)

SPECIFICATIONS

• GENERAL

Power requirements	AC 110-240V, 50/60 Hz
Power consumption	45W
Dimensions (approx.)	430 X 49 X 350 mm (w x h x d) without foot
Mass (approx.)	4.6 kg
Operating temperature	5˚C to 35˚C
Operating humidity	5 % to 90 %
Recording format	PAL

• RECORDING

Recording format	DVD Video Recording, DVD-VIDEO
Recordable media	HDD (80GB), DVD-ReWritable, DVD-Recordable, DVD+ReWritable, DVD+Recordable, DVD+Recordable (Double Layer)
Recordable time	DVD (4.7GB): Approx. 1 hour (HQ mode), 2 hours (SQ mode), 4 hours (LQ mode), 6 hours (EQ mode) DVD+R DL (8.5GB): Approx. 3 hour (HQ mode), 3 hours 40 minutes (SQ mode), 7 hours 10 minutes (LQ mode), 11 hours 30 minutes (EQ mode) HDD (80GB): Approx. 20 hour (HQ mode), 40 hours (SQ mode), 74 hours (LQ mode), 111 hours (EQ mode)
Video recording format	
Sampling frequency	27MHz
Compression format	MPEG 2 (VBR support)
Audio recording format	
Sampling frequency	48kHz
Compression format	Dolby Digital

• PLAYBACK

Frequency response	DVD (PCM 48 kHz): 8 Hz to 20 kHz, CD: 8 Hz to 20 kHz DVD (PCM 96 kHz): 8 Hz to 44 kHz
Signal-to-noise ratio	More than 100 dB (AUDIO OUT connector)
Harmonic distortion	Less than 0.008% (AUDIO OUT connector)
Dynamic range	More than 95 dB (AUDIO OUT connector)

• INPUTS

AERIAL IN	Aerial input, 75 ohms
VIDEO IN	1.0 Vp-p 75 ohms, sync negative, RCA jack x 2 / SCART x 2
AUDIO IN	0 dBm more than 47 kohms, RCA jack (L, R) x 2 / SCART x 2
DV IN	4 pin (IEEE 1394 standard)

• OUTPUTS

VIDEO OUT	1 Vp-p 75 Ω, sync negative, RCA jack x 1 / SCART x 2
COMPONENT VIDEO OUT	(Y) 1.0 V (p-p), 75 Ω, negative sync, RCA jack x 1 (Pb)/(Pr) 0.7 V (p-p), 75 Ω, RCA jack x 2
Audio output (digital audio)	0.5 V (p-p), 75 Ω, RCA jack x 1
Audio output (optical audio)	3 V (p-p), 75 Ω, Optical connector x 1
Audio output (analog audio)	2.0 Vrms (1 KHz, 0 dB), 600 Ω, RCA jack (L, R) x 1 / SCART x 2

SECTION 2

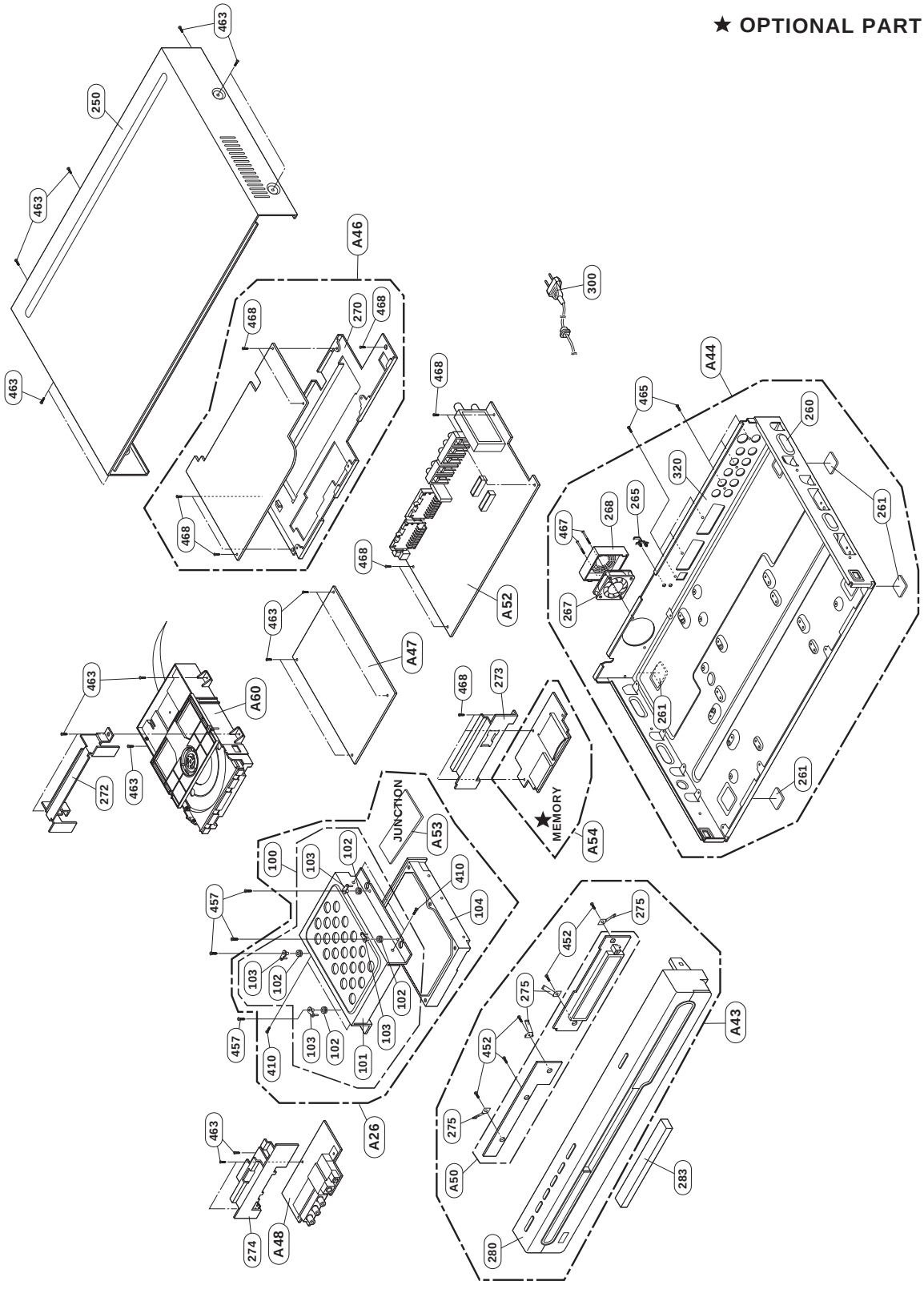
CABINET & MAIN CHASSIS

CONTENTS

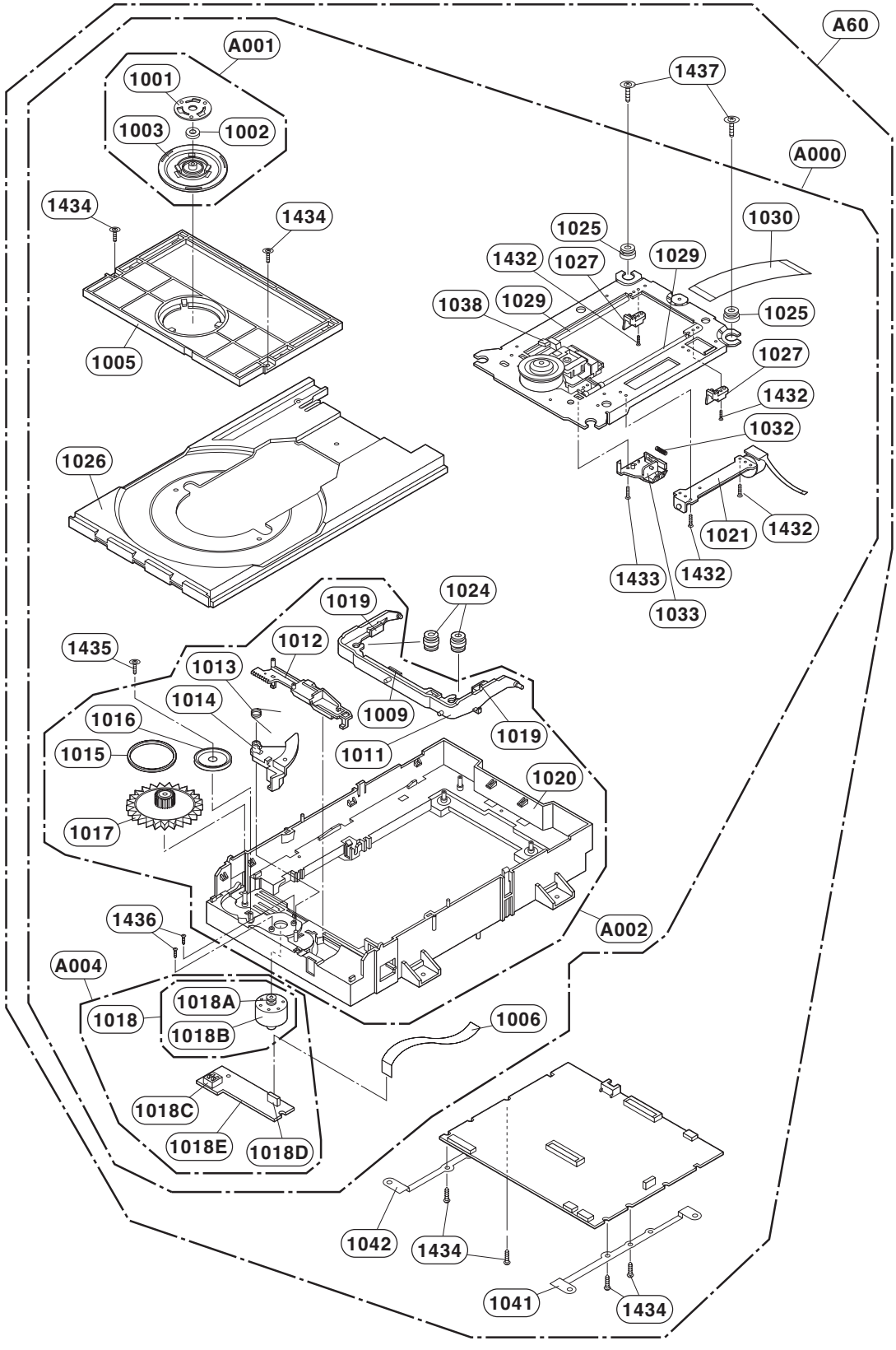
EXPLODED VIEWS

1. Cabinet and Main Frame Section

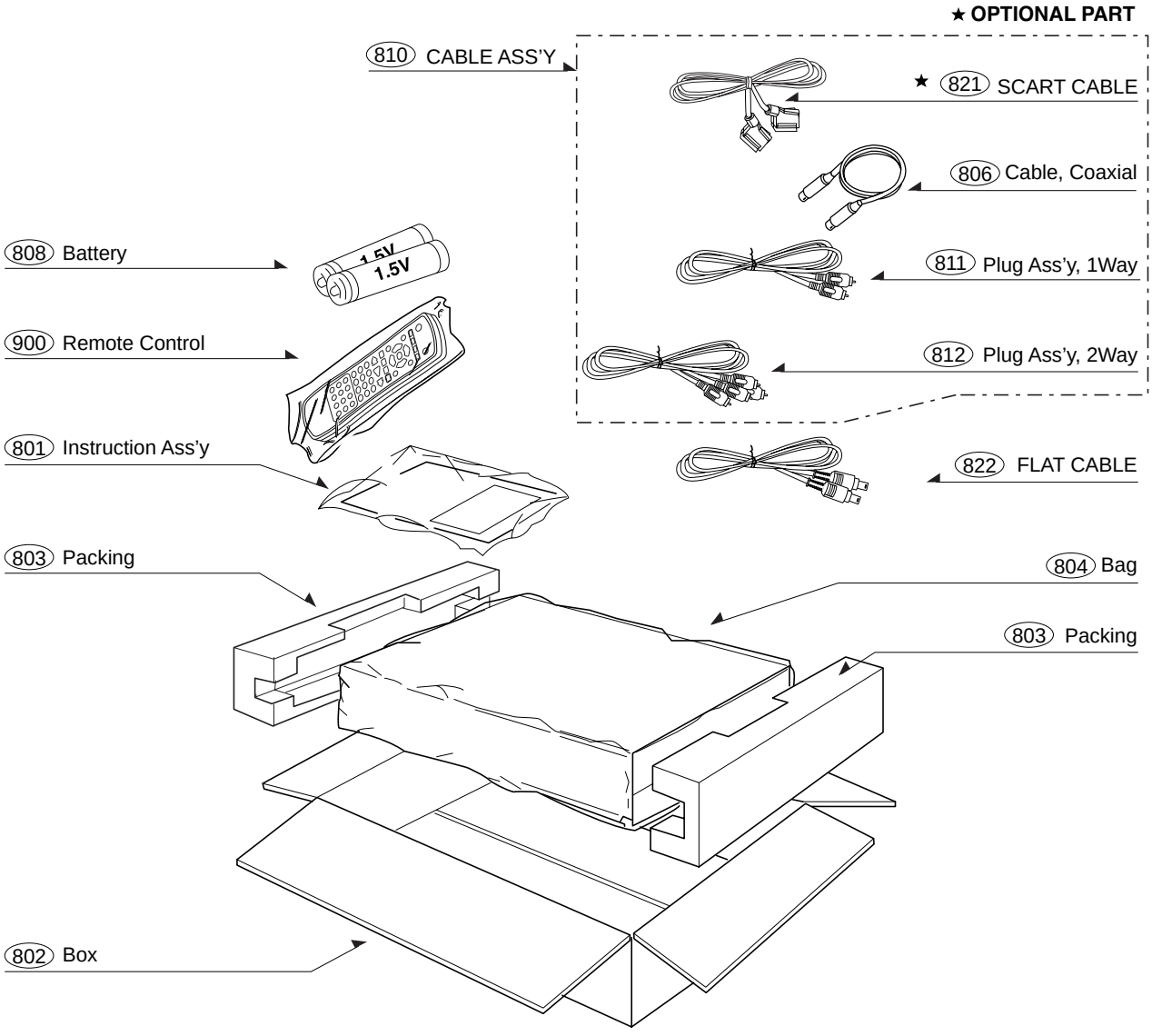
★ OPTIONAL PART



2. DECK MECHANISM SECTION(RL-05S)



3. Packing Accessory Section



SECTION 3
ELECTRICAL

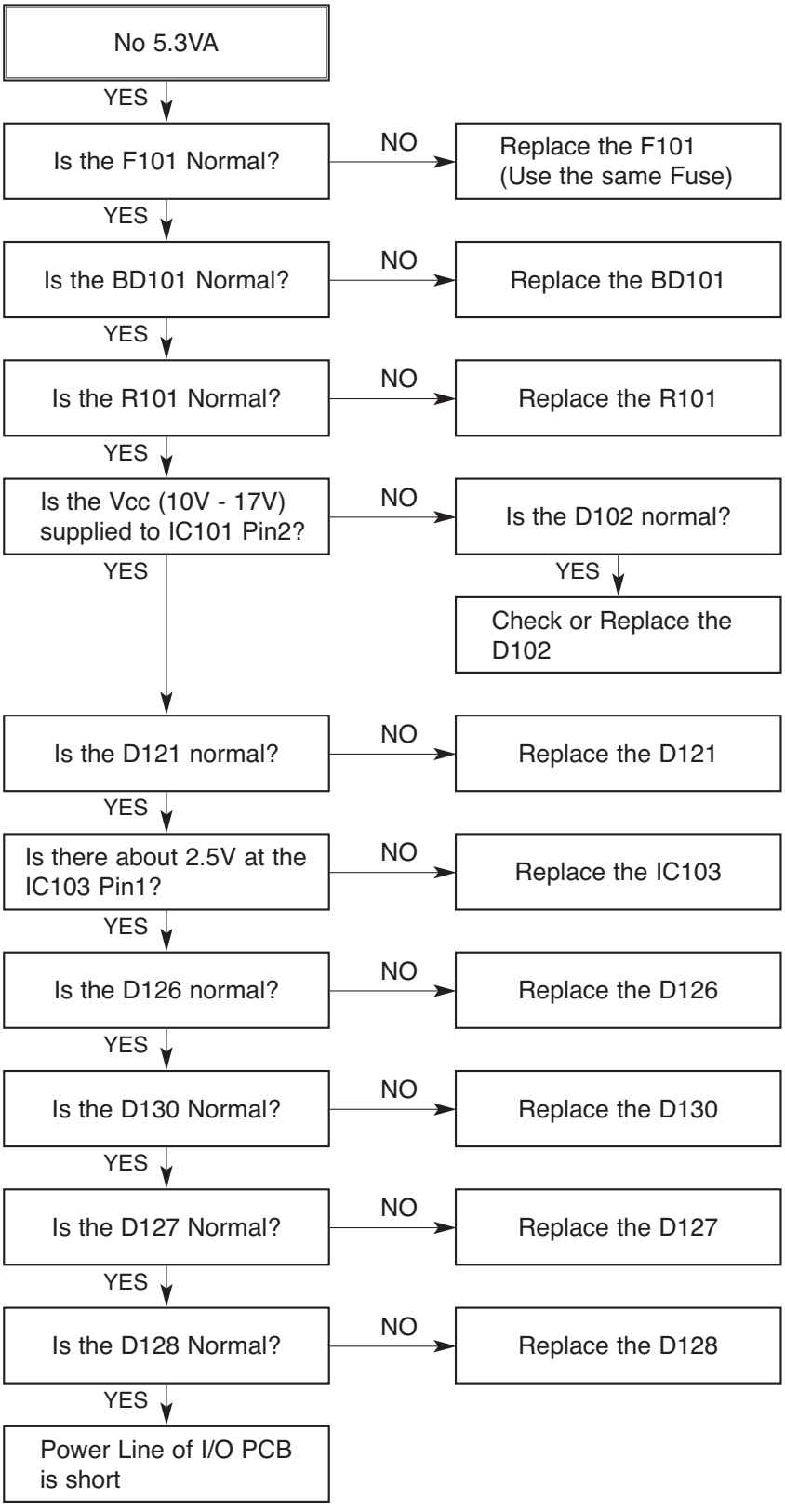
CONTENTS

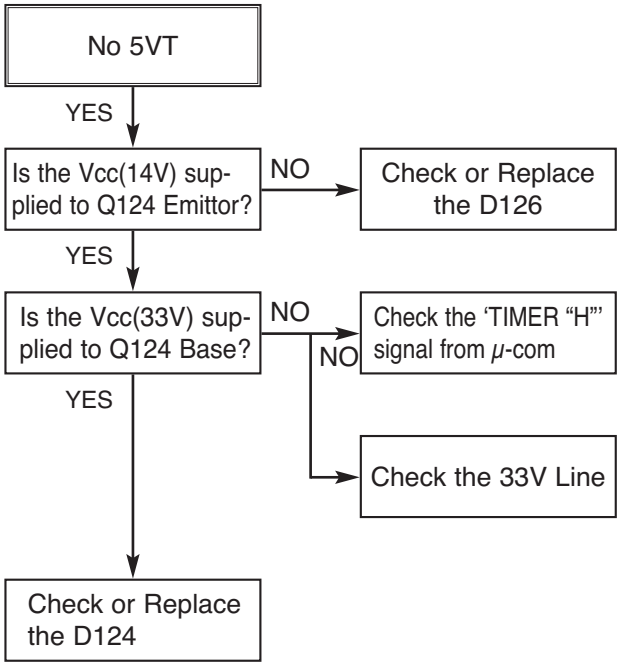
HDR PART

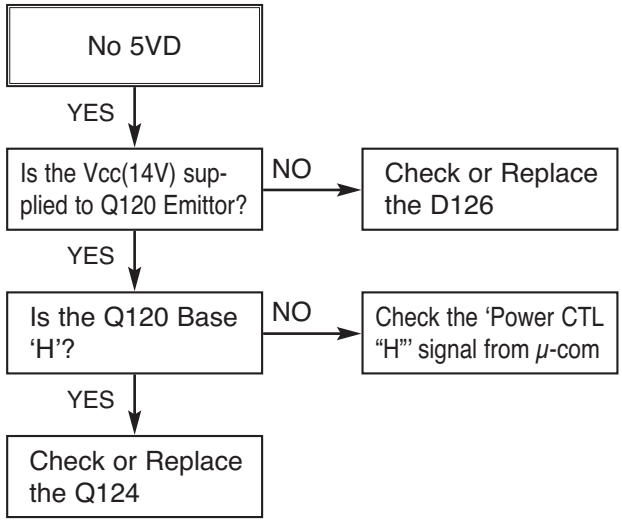
HDR PART

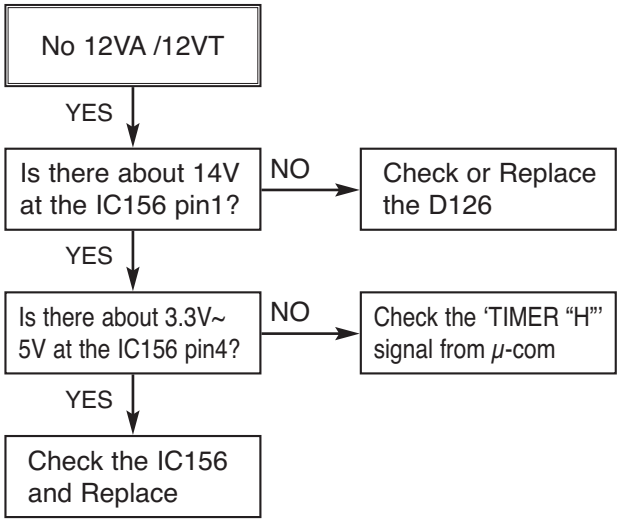
ELECTRICAL TROUBLESHOOTING GUIDE

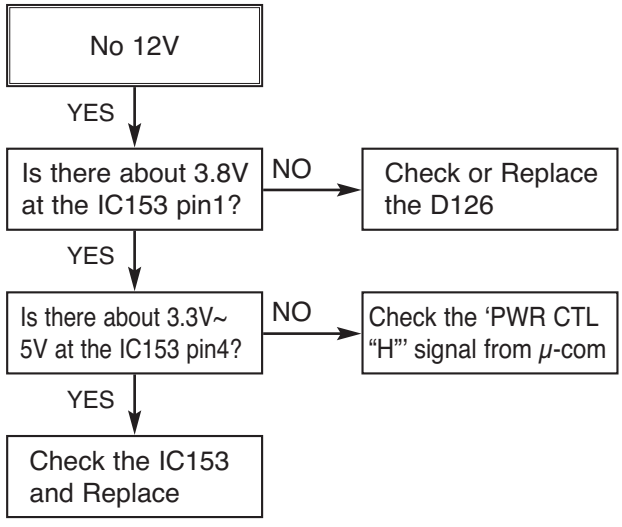
1. SMPS I/O PART 1. SMPS I/O PART

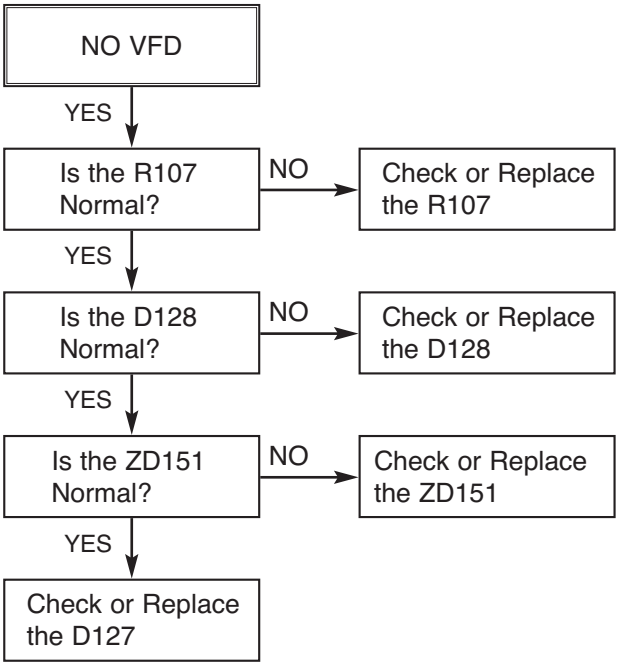


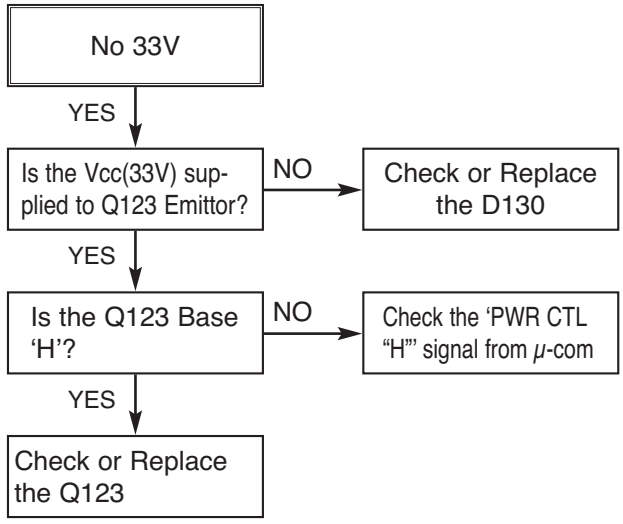

No 5VT
YES
Is the Vcc(14V) supplied to Q124 Emittor?
NO
Check or Replace the D126
YES
Is the Vcc(33V) supplied to Q124 Base?
NO
Check the 'TIMER "H"' signal from μ-com
NO
Check the 33V Line
YES
Check or Replace the D124


No 5VD
YES
Is the Vcc(14V) supplied to Q120 Emittor?
NO
Check or Replace the D126
YES
Is the Q120 Base 'H'?
NO
Check the 'Power CTL "H"' signal from μ-com
YES
Check or Replace the Q124

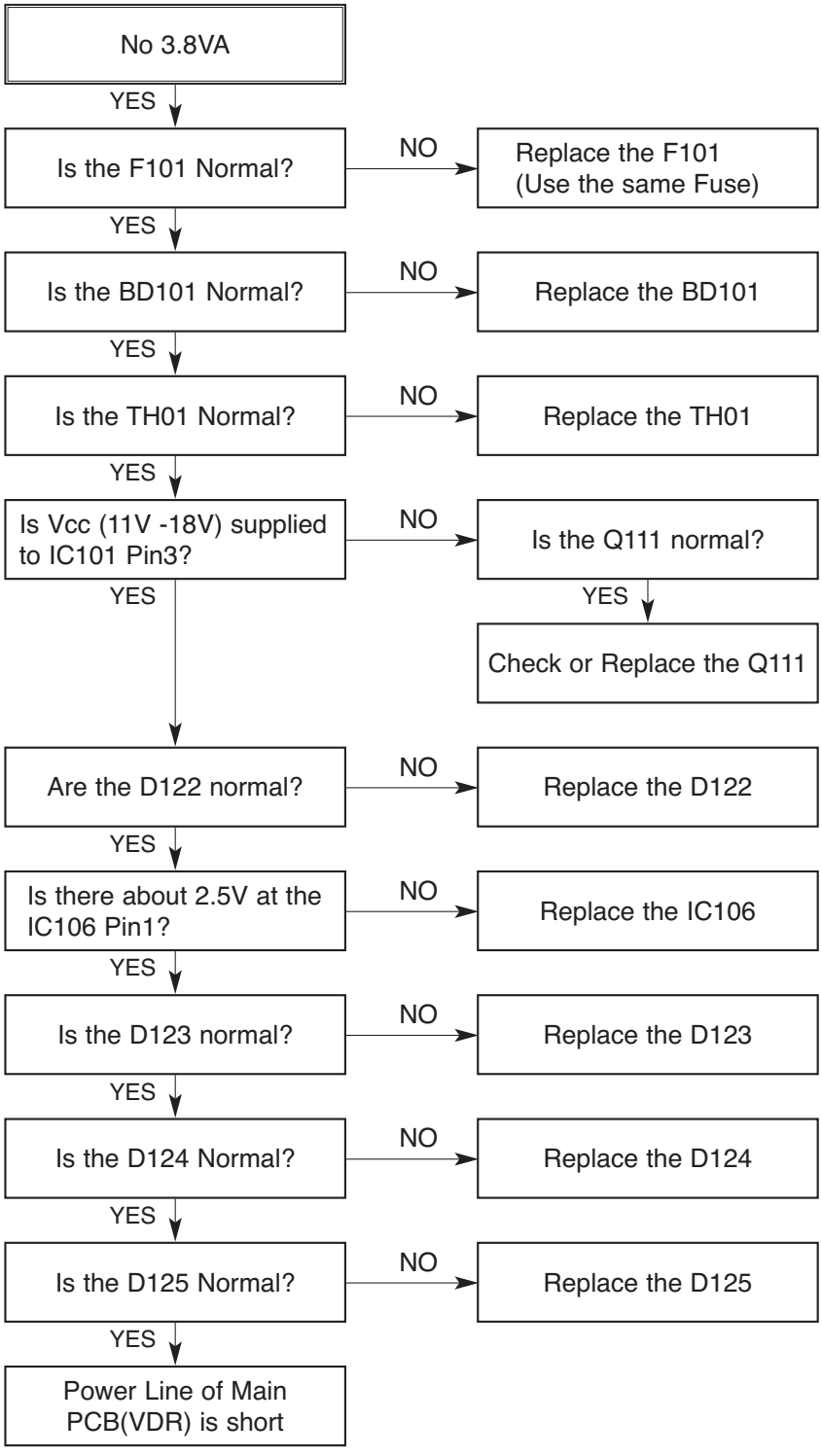

No 12VA /12VT
YES
Is there about 14V at the IC156 pin1?
NO
Check or Replace the D126
YES
Is there about 3.3V~ 5V at the IC156 pin4?
NO
Check the 'TIMER "H"' signal from μ-com
YES
Check the IC156 and Replace

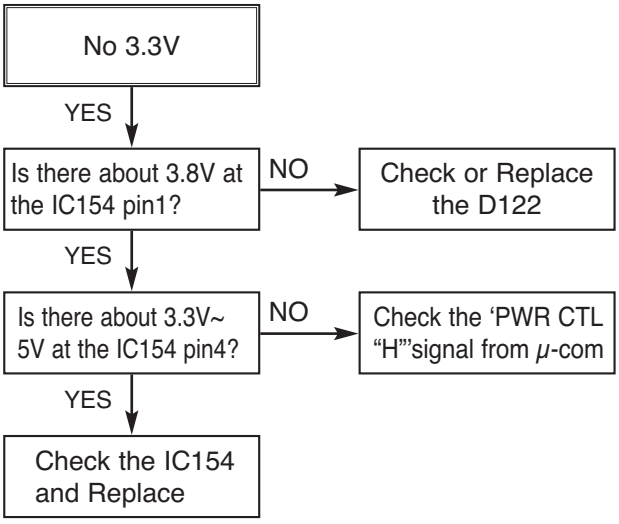

No 12V
YES
Is there about 3.8V at the IC153 pin1?
NO
Check or Replace the D126
YES
Is there about 3.3V~ 5V at the IC153 pin4?
NO
Check the 'PWR CTL "H"' signal from μ-com
YES
Check the IC153 and Replace

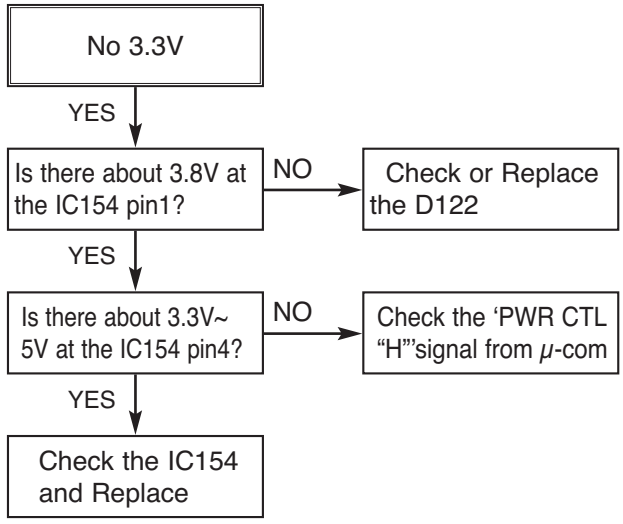

NO VFD
YES
Is the R107 Normal?
NO
Check or Replace the R107
YES
Is the D128 Normal?
NO
Check or Replace the D128
YES
Is the ZD151 Normal?
NO
Check or Replace the ZD151
YES
Check or Replace the D127

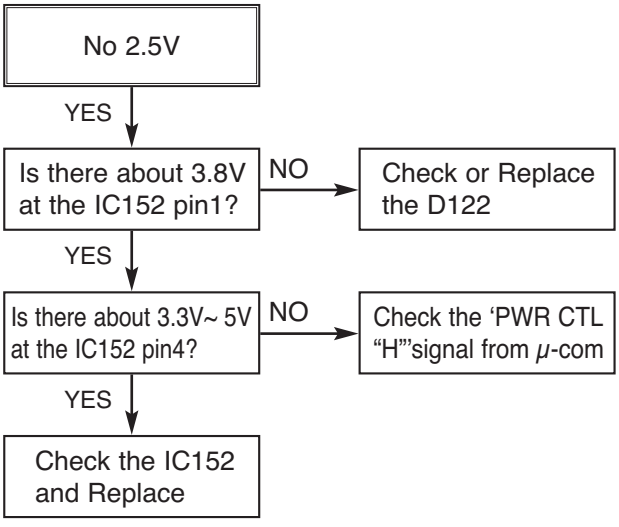

No 33V
YES
Is the Vcc(33V) supplied to Q123 Emittor?
NO
Check or Replace the D130
YES
Is the Q123 Base 'H'?
NO
Check the 'PWR CTL "H"' signal from μ-com
YES
Check or Replace the Q123

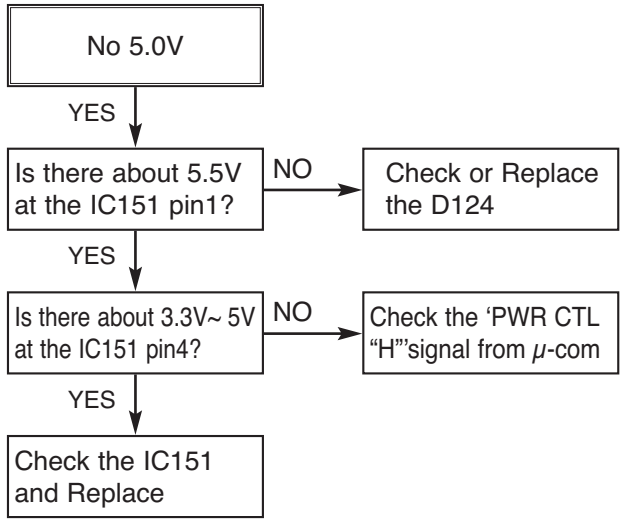
2. SMPS DVD/HDD PART

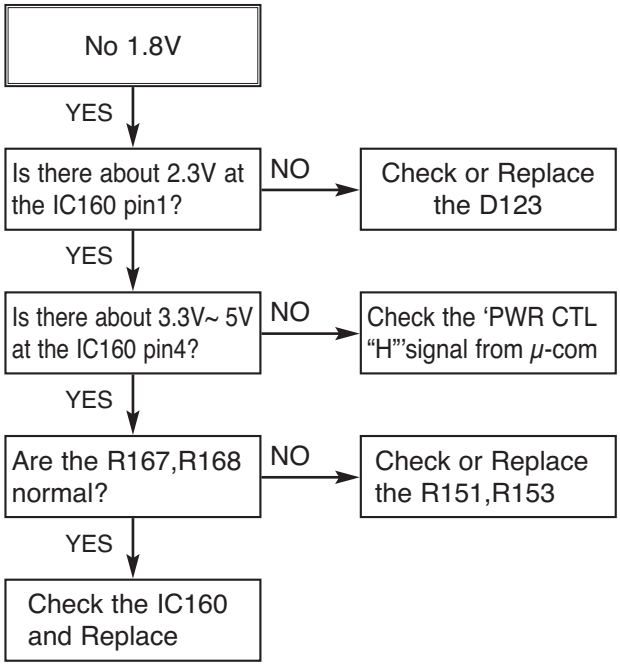


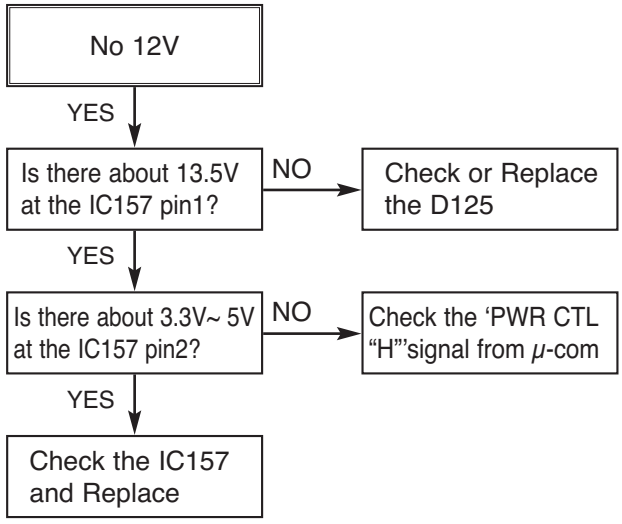

No 3.3V
YES
Is there about 3.8V at the IC154 pin1?
NO
Check or Replace the D122
YES
Is there about 3.3V~ 5V at the IC154 pin4?
NO
Check the 'PWR CTL "H"'signal from μ-com
YES
Check the IC154 and Replace


No 3.3V
YES
Is there about 3.8V at the IC154 pin1?
NO
Check or Replace the D122
YES
Is there about 3.3V~ 5V at the IC154 pin4?
NO
Check the 'PWR CTL "H"'signal from μ-com
YES
Check the IC154 and Replace

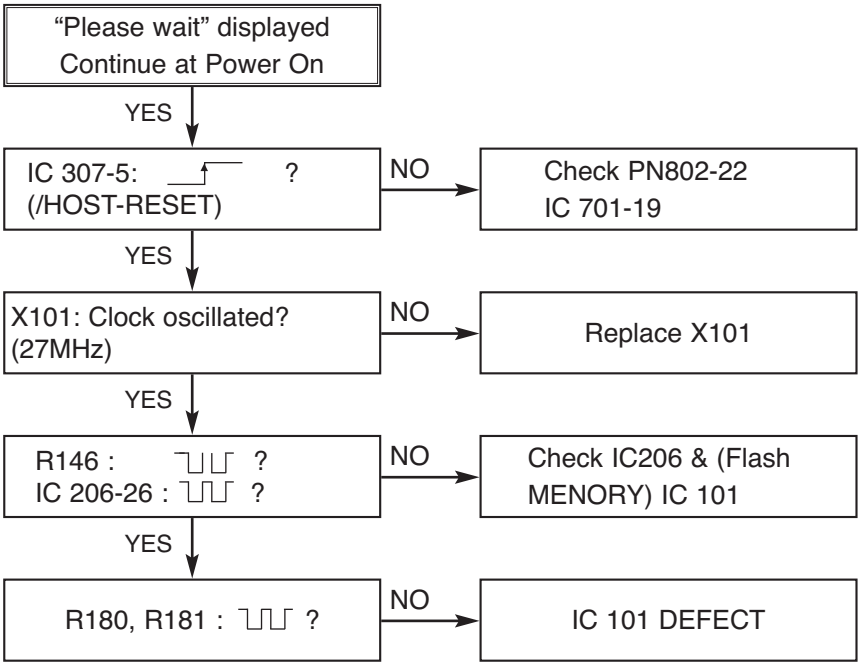

No 2.5V
YES
Is there about 3.8V at the IC152 pin1?
NO
Check or Replace the D122
YES
Is there about 3.3V~ 5V at the IC152 pin4?
NO
Check the 'PWR CTL "H"'signal from μ-com
YES
Check the IC152 and Replace


No 5.0V
YES
Is there about 5.5V at the IC151 pin1?
NO
Check or Replace the D124
YES
Is there about 3.3V~ 5V at the IC151 pin4?
NO
Check the 'PWR CTL "H"'signal from μ-com
YES
Check the IC151 and Replace

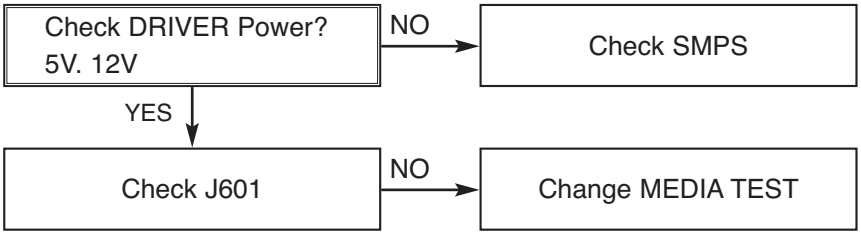

No 1.8V
YES
Is there about 2.3V at the IC160 pin1?
NO
Check or Replace the D123
YES
Is there about 3.3V~ 5V at the IC160 pin4?
NO
Check the 'PWR CTL "H"'signal from μ-com
YES
Are the R167,R168 normal?
NO
Check or Replace the R151,R153
YES
Check the IC160 and Replace


No 12V
YES
Is there about 13.5V at the IC157 pin1?
NO
Check or Replace the D125
YES
Is there about 3.3V~ 5V at the IC157 pin2?
NO
Check the 'PWR CTL "H"'signal from μ-com
YES
Check the IC157 and Replace

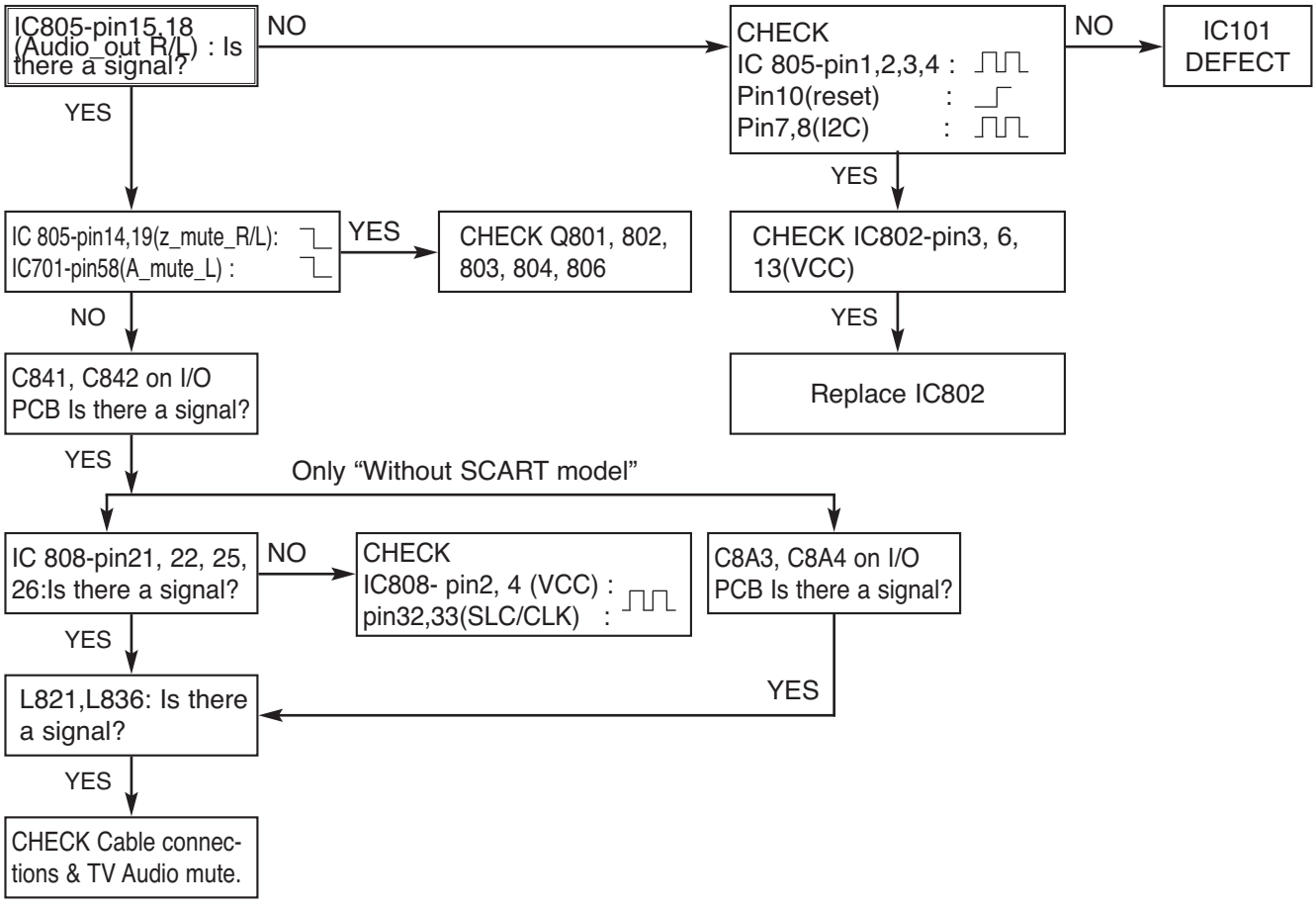
3. SYSTEM Circuit PART



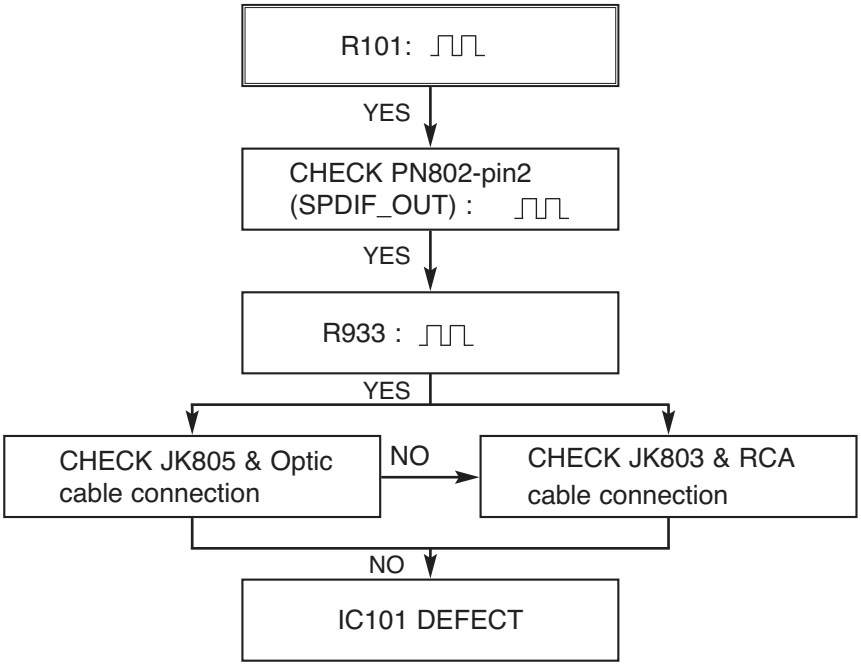
4. DISC not recognized



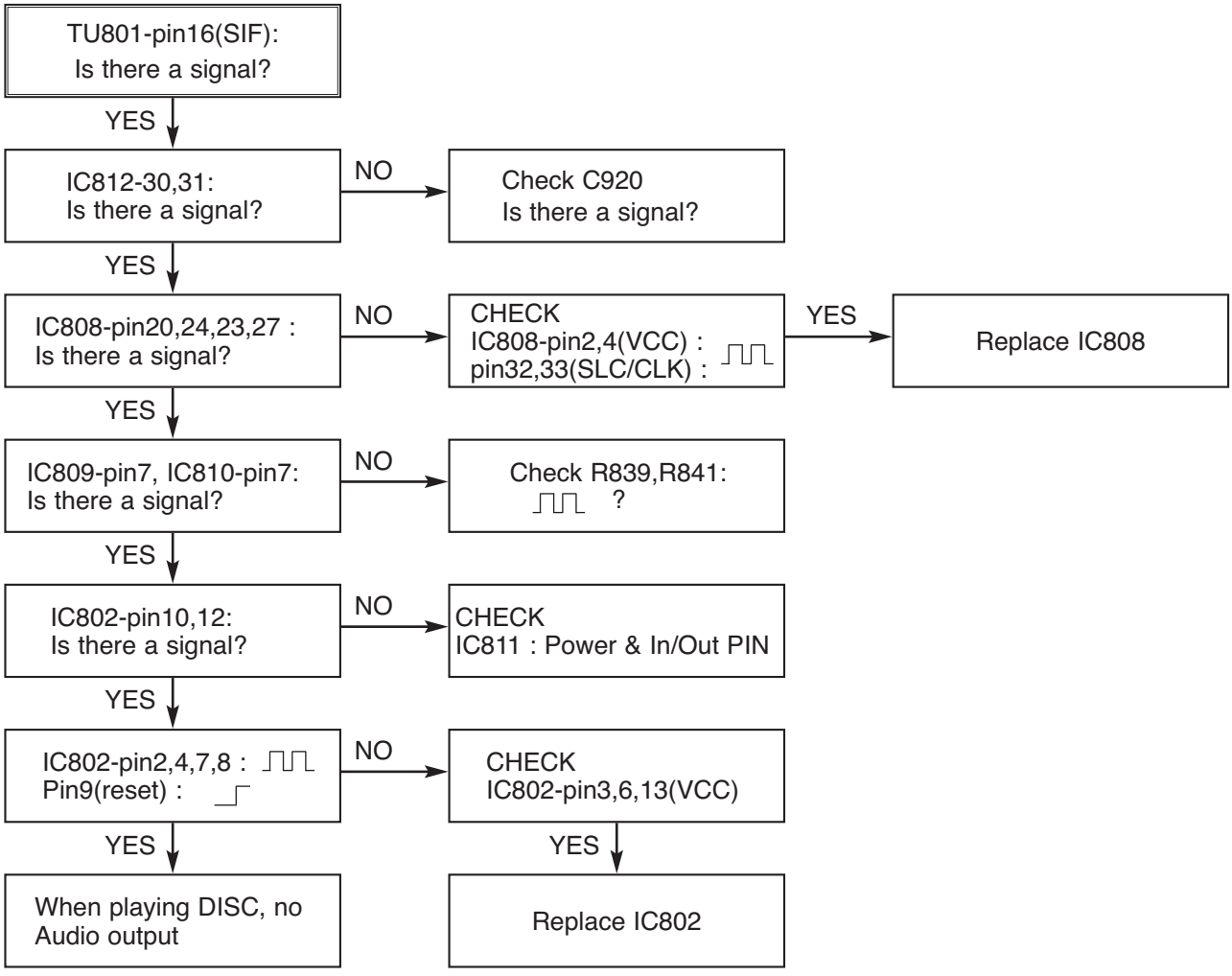
5. When playing DISC, no Audio output



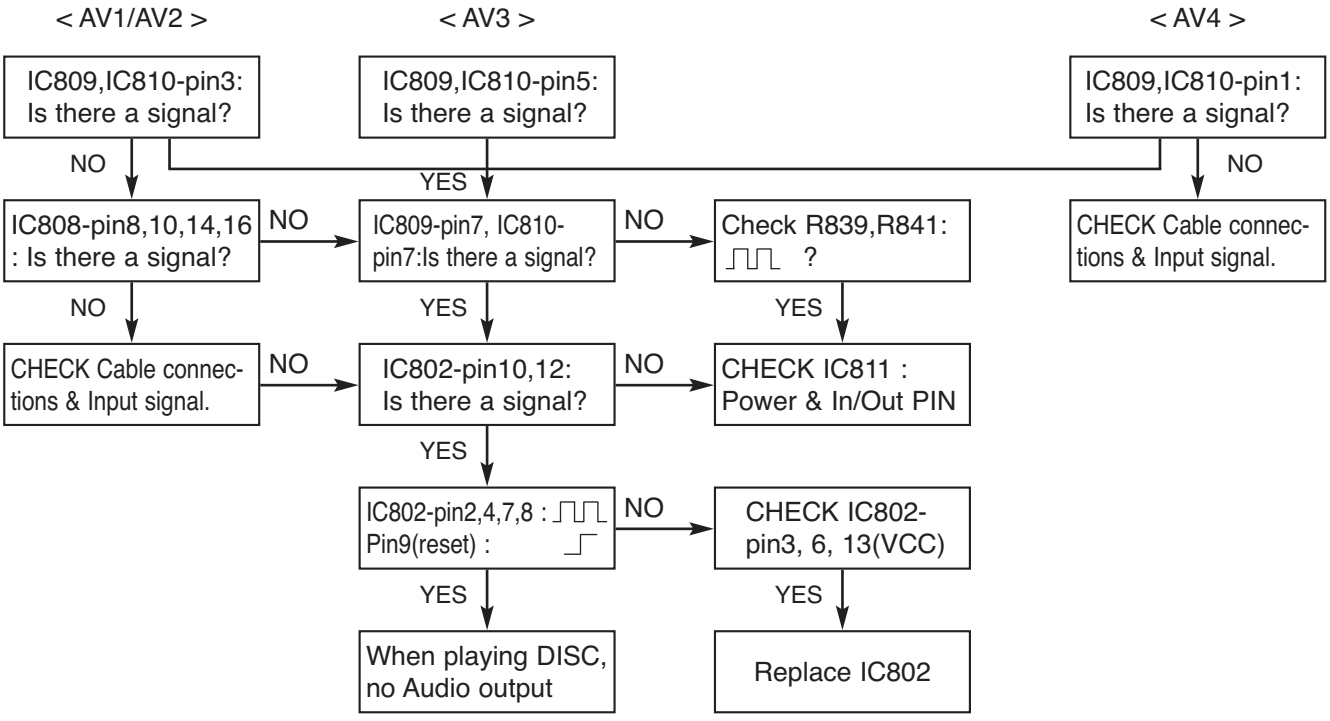
6. No OPTICAL/DIGITAL Output



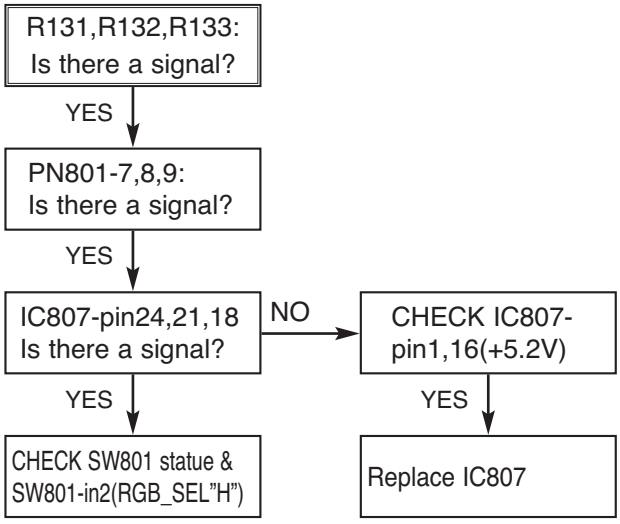
7. No TUNER Audio Output



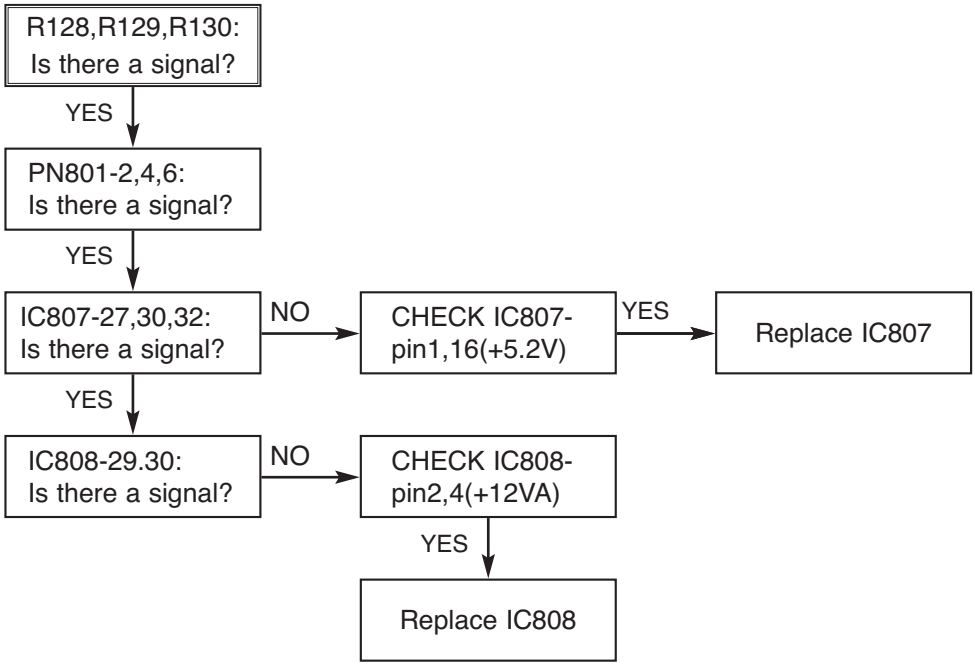
8. No External input Audio



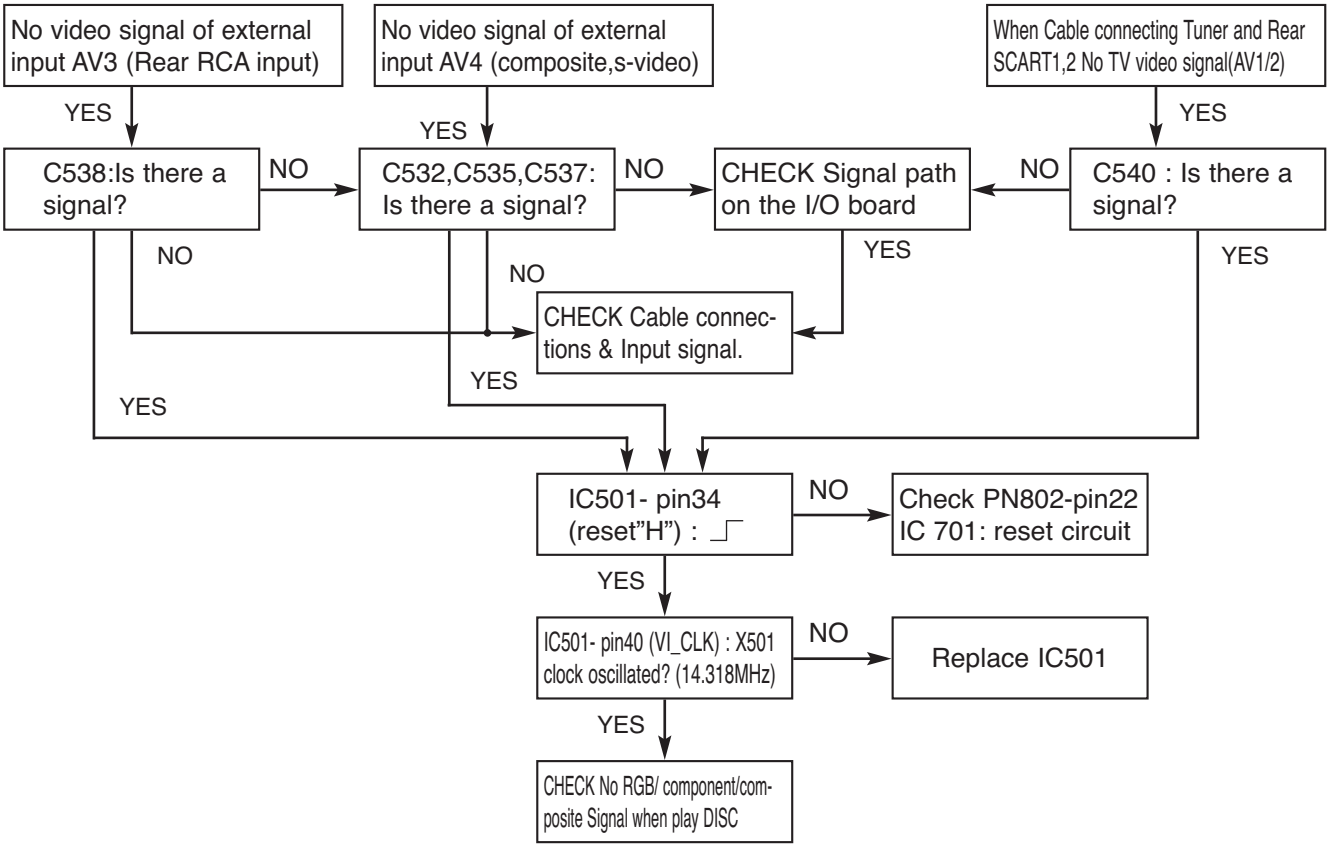
9. No RGB/Component Video signal when play DISC



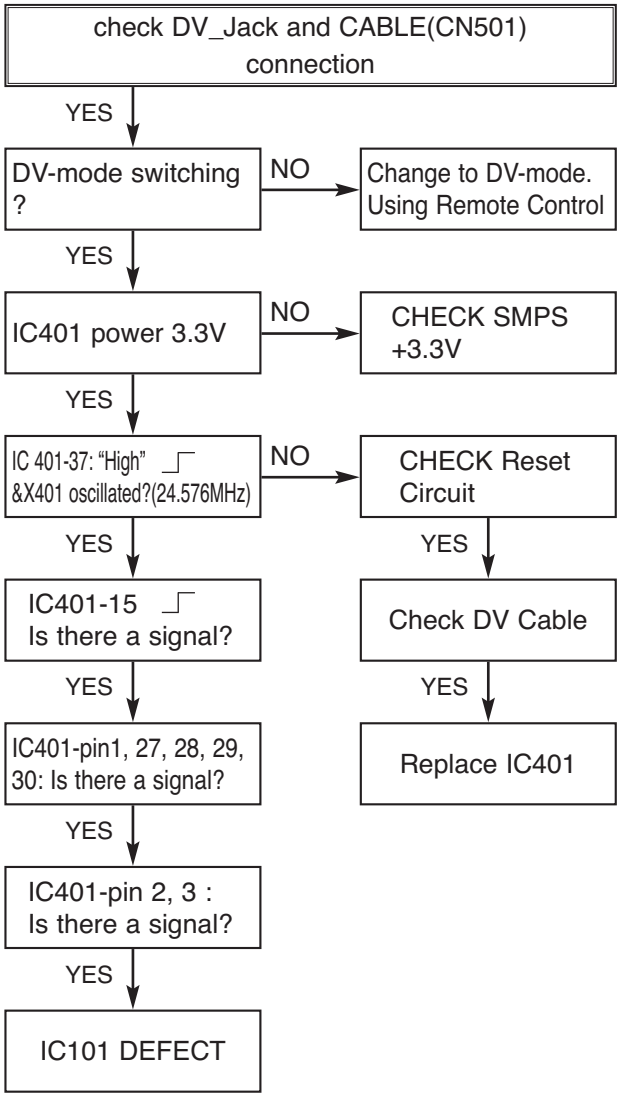
10. No composite/s-video Signal when play DISC



11. No TV, External input Video signal

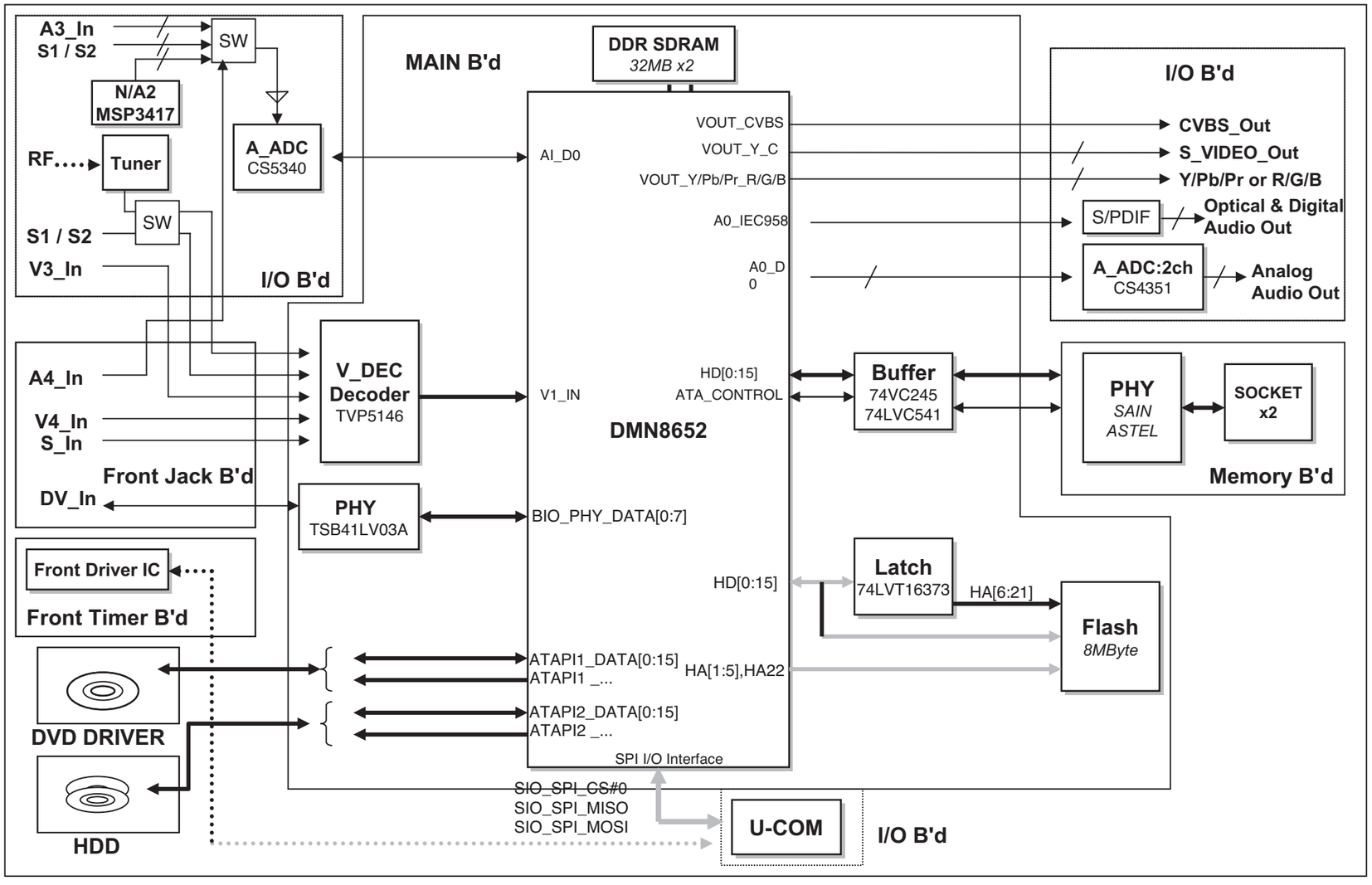


12. No DV(IEEE 1394)input(Video/Audio) signal

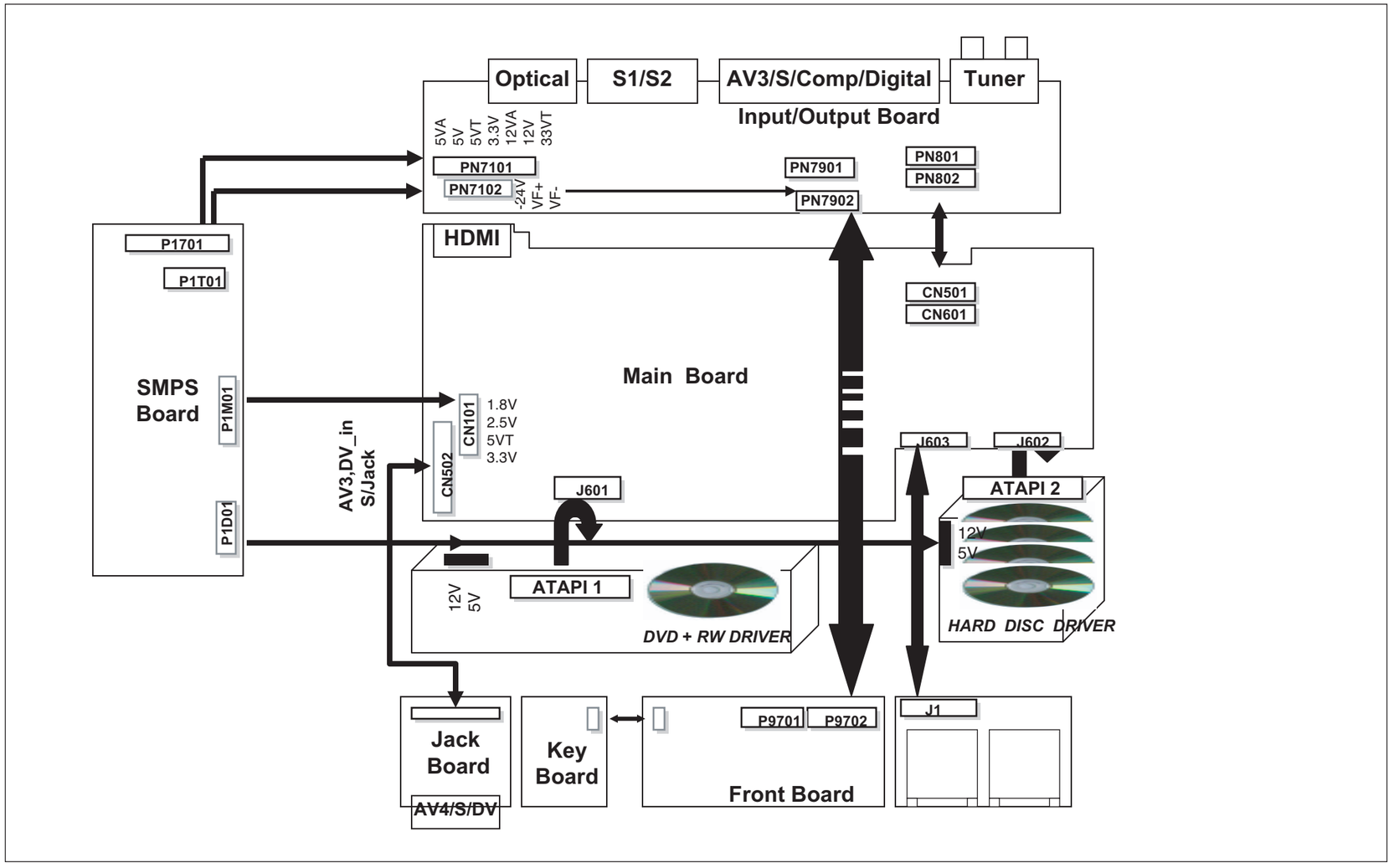


BLOCK DIAGRAMS

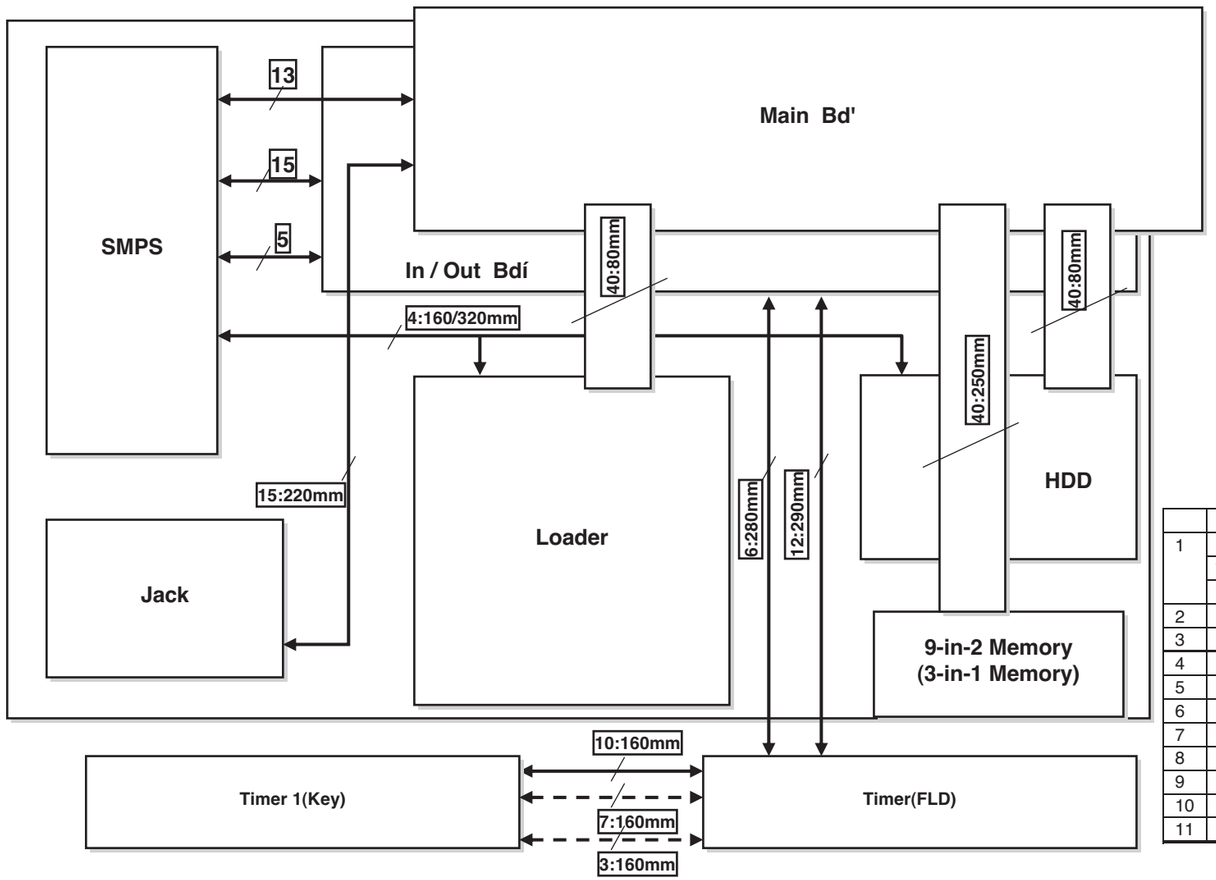
1. Overall Block Diagram



2. Layout Connection Block Diagram_1

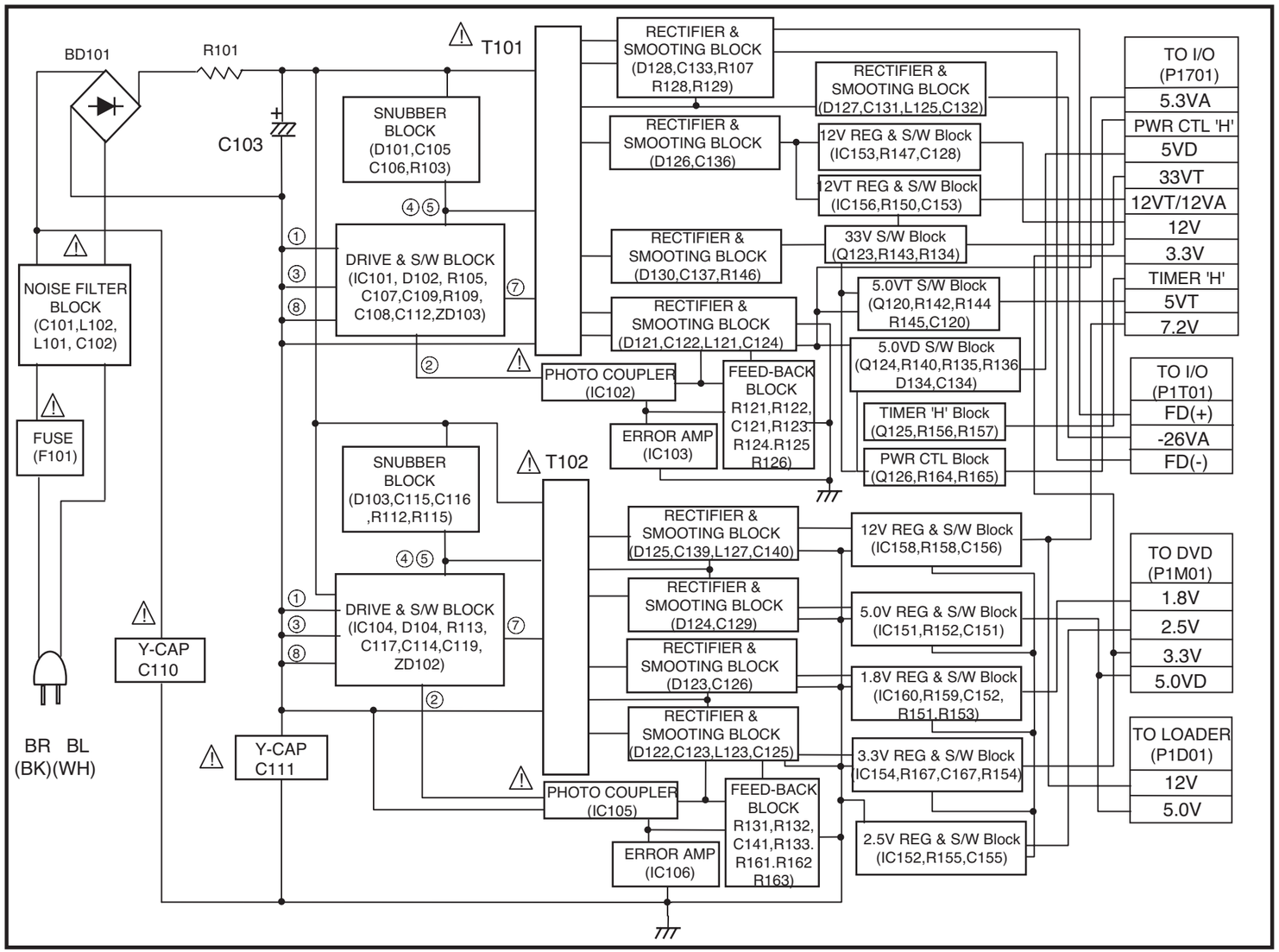


3. Layout Connection Block Diagram_2

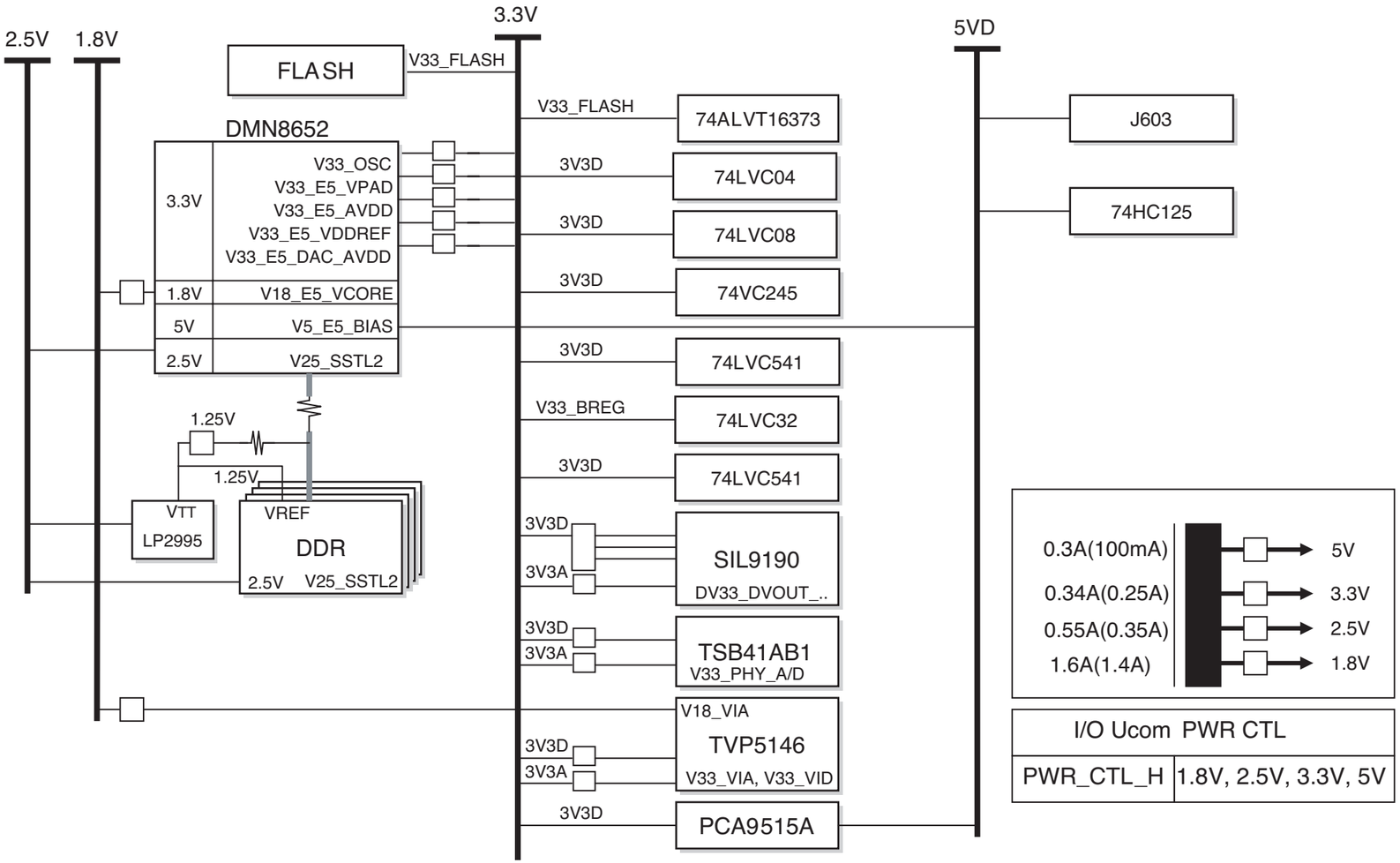


	PIN	P / N	
1	10P(8T)	6631R-E092E	T ↔ K
	7P(5.9T)	6631R-E092F	T ↔ K
	3P(6T)	6631R-E092G	T ↔ K
2	6P	6631R-E066F	T ↔ M
3	12P	6631R-E066E	T ↔ M
4	40P		M ↔ m
5	40P	6850R-EA08Y	M ↔ H
6	40P	6850R-EA08Y	M ↔ L
7	15P	6631R-E044D	M ↔ J
8	4P/6P	6631R-H003A	P↔L↔H
9	5P	6631R-E092D	P ↔ I
10	15P	6631R-E092C	P ↔ I
11	13P	6631R-E025S	P ↔ I

4. SMPS Block Diagram

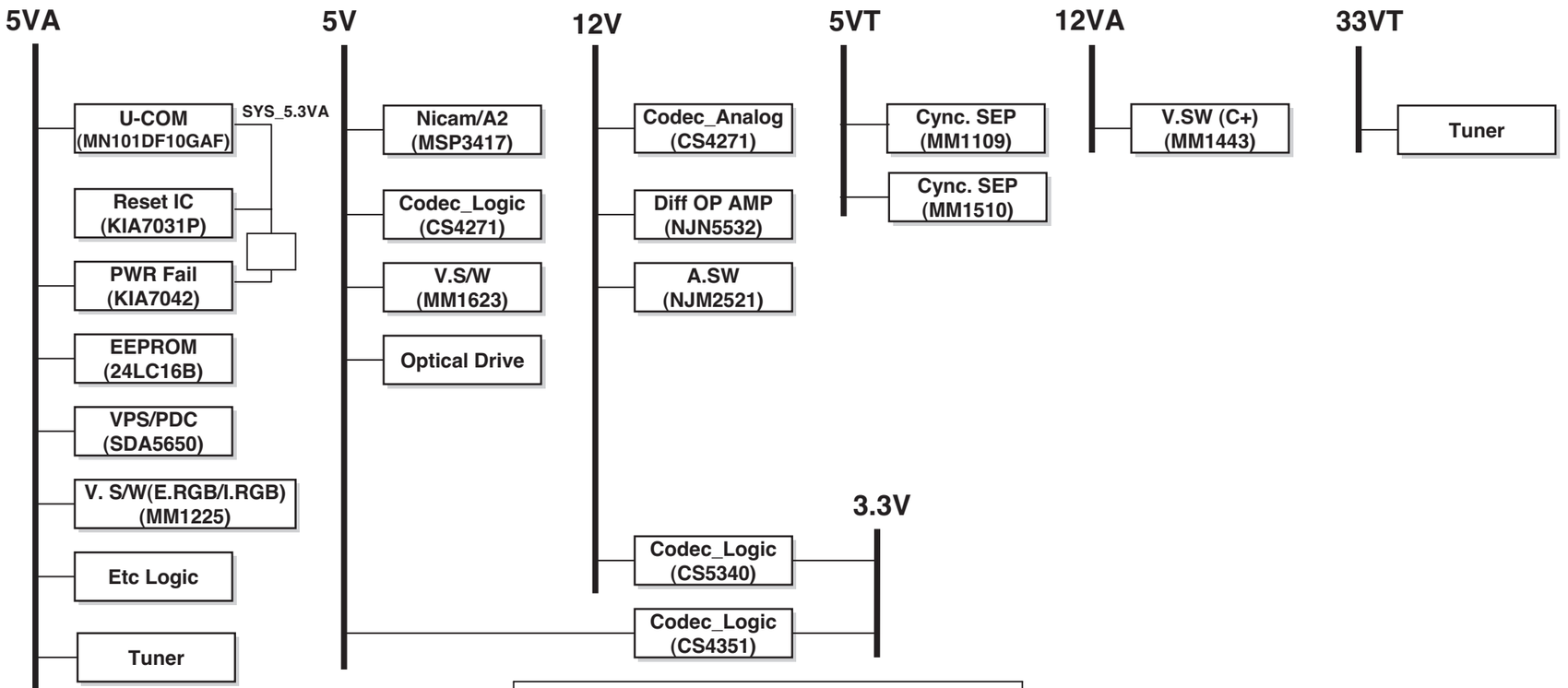


5. Power : Main Board Block Diagram



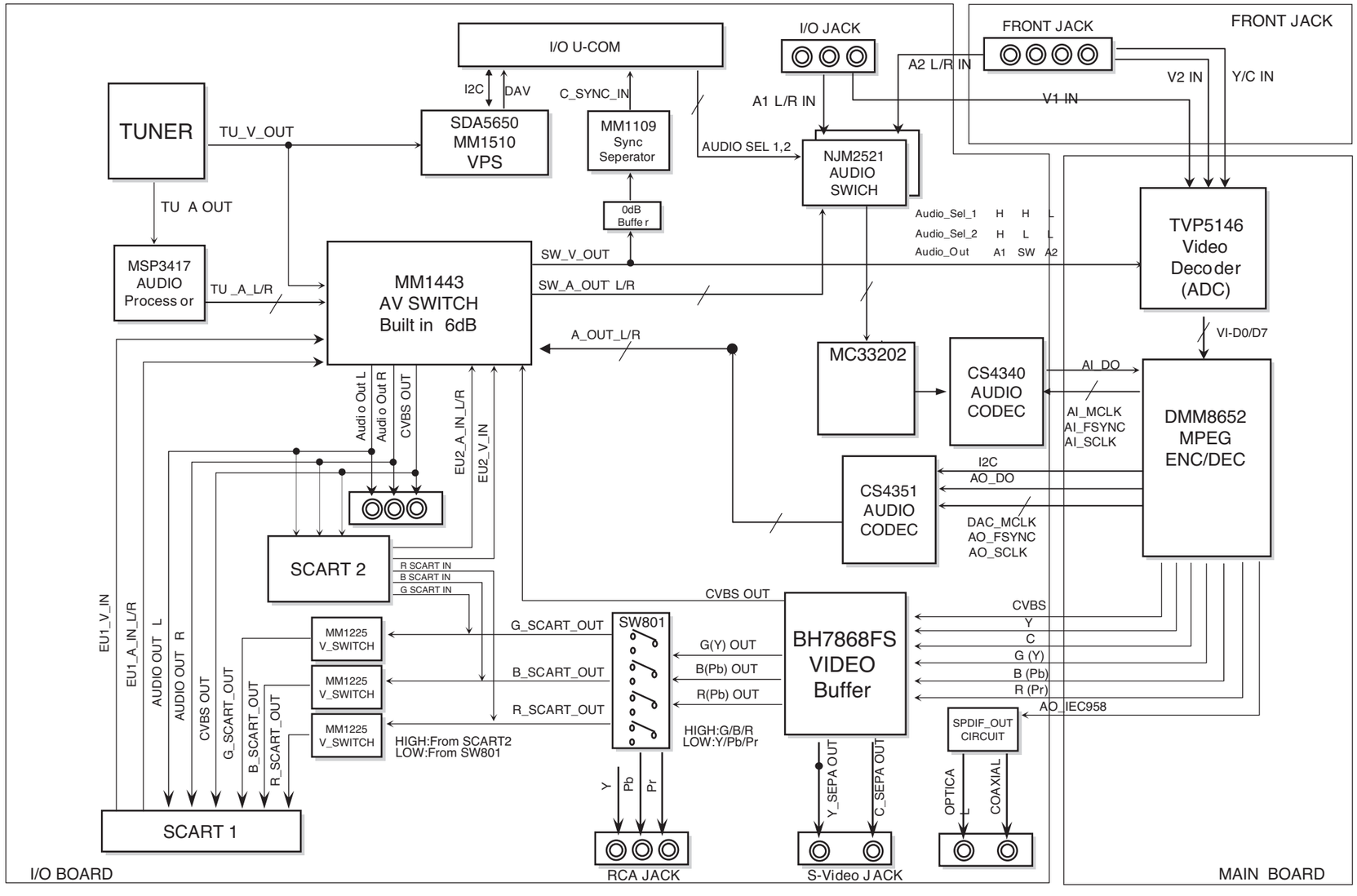
I/O Ucom PWR CTL	
PWR_CTL_H	1.8V, 2.5V, 3.3V, 5V

6. Power : I/O Board Block Diagram

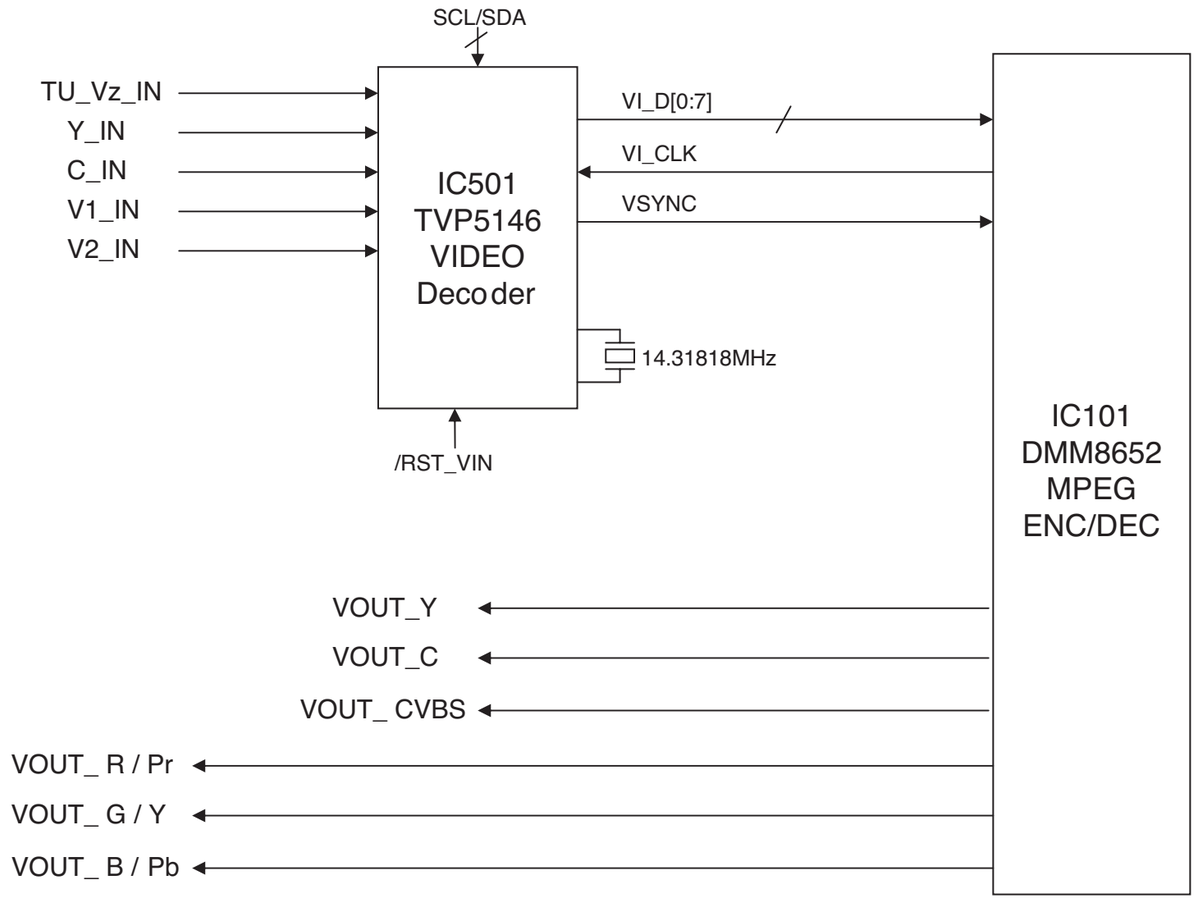


I/O Ucom PWR CTL SIGNAL	
PWR_CTL_H	5V, 12V CONTROL
TIMER_H	5VT, 12VA, 33VT

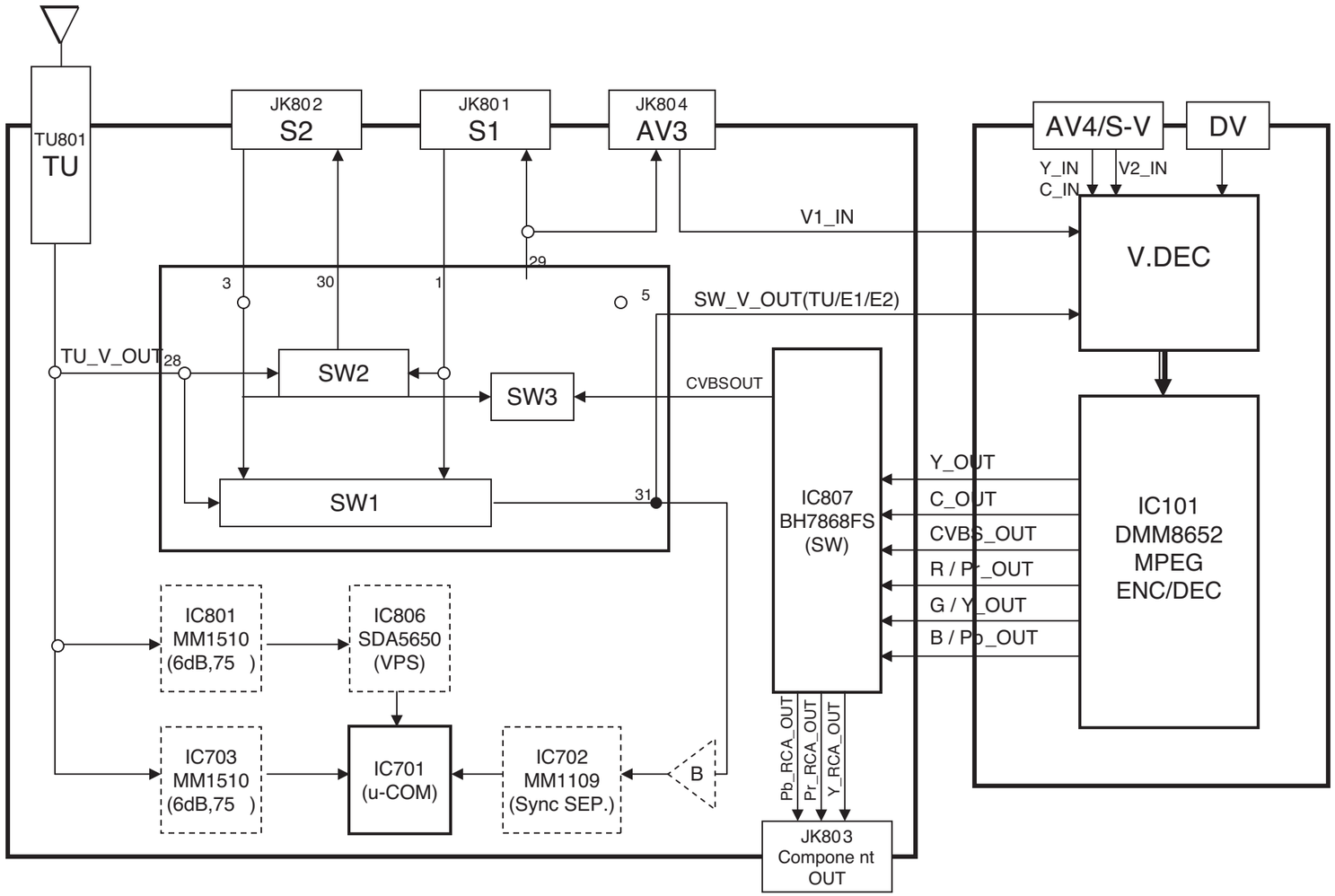
7. In/Out Block Diagram



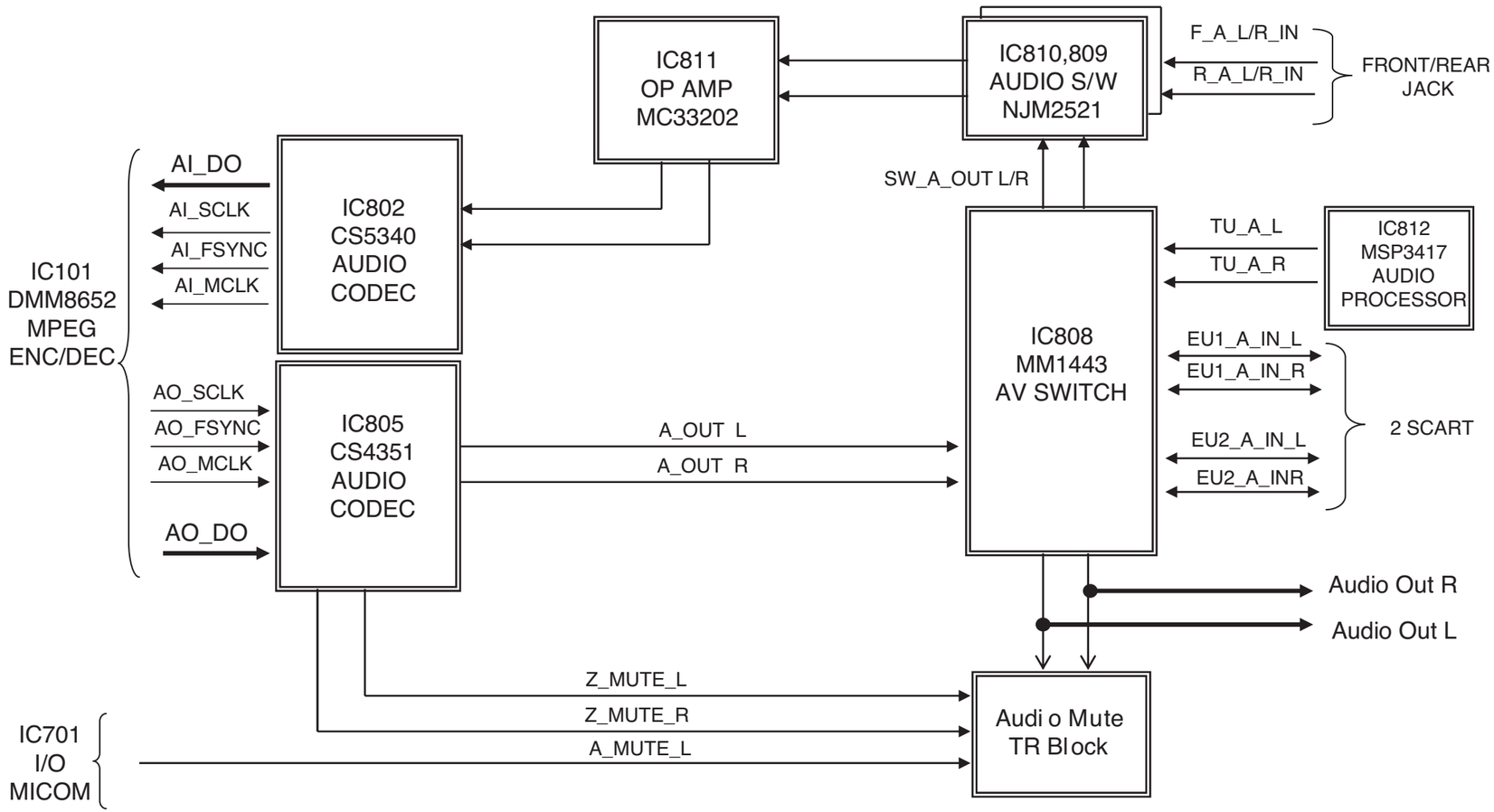
8. Video Block Diagram



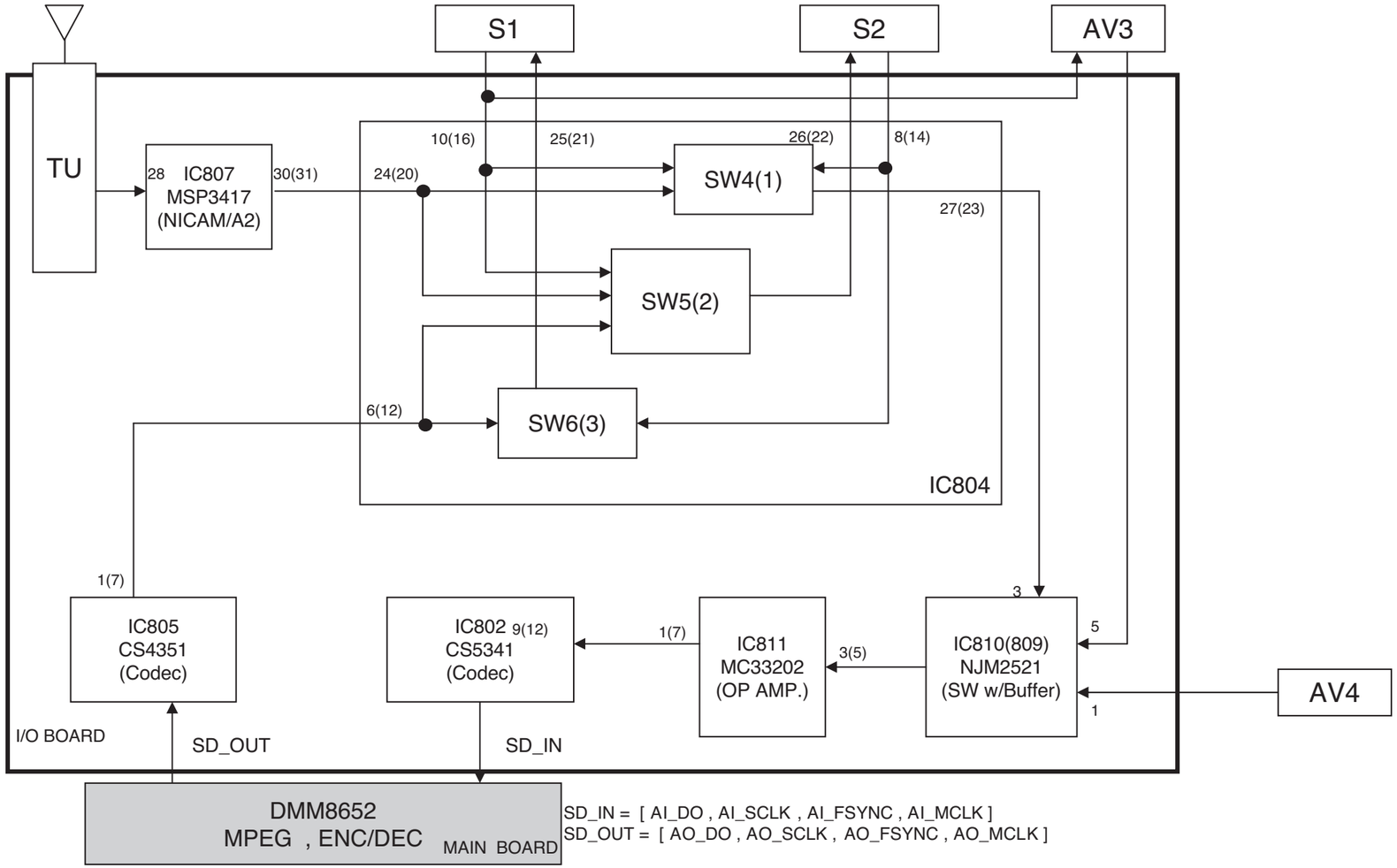
9. Video SW Path Block Diagram



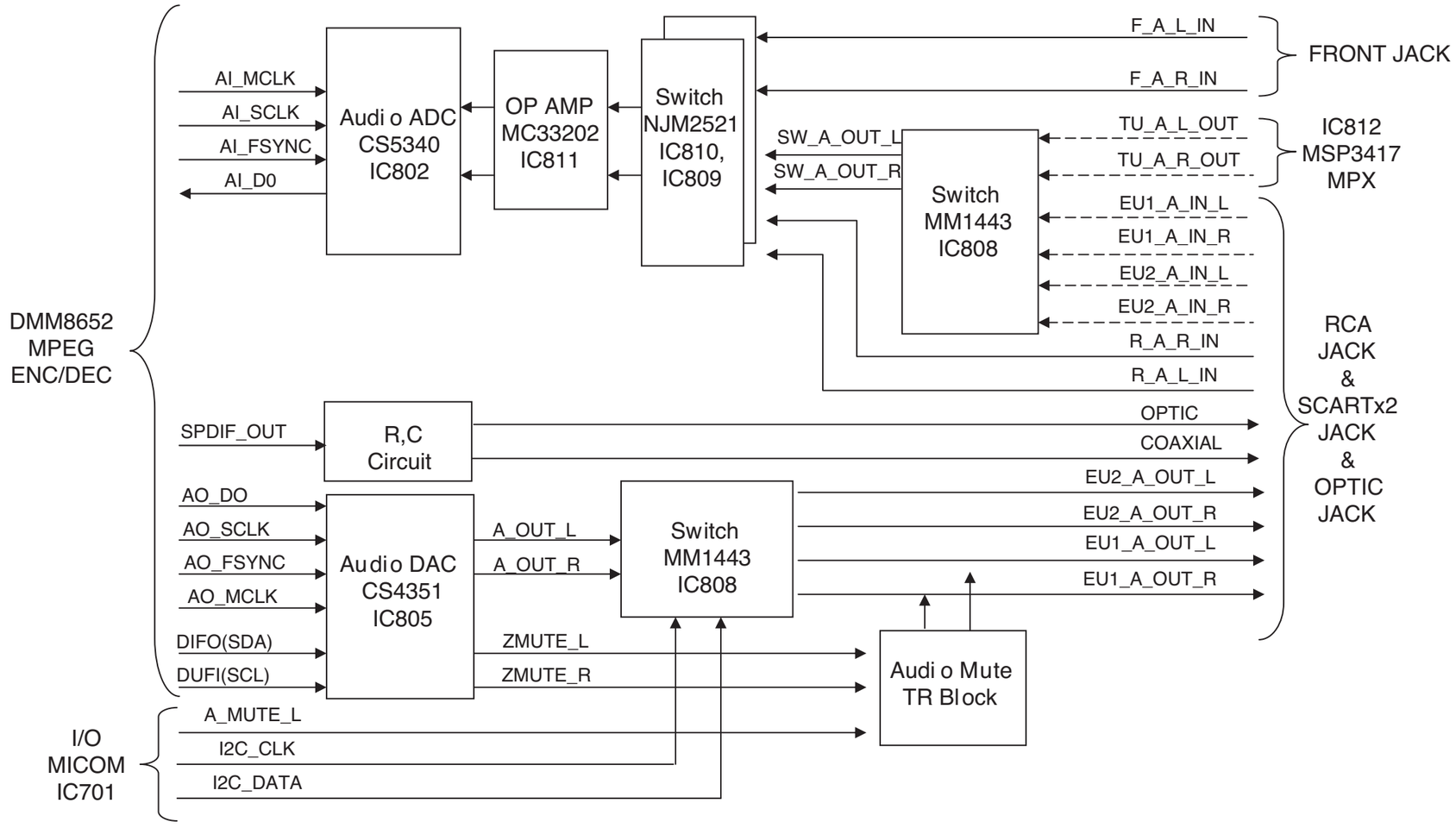
10. Audio Block Diagram



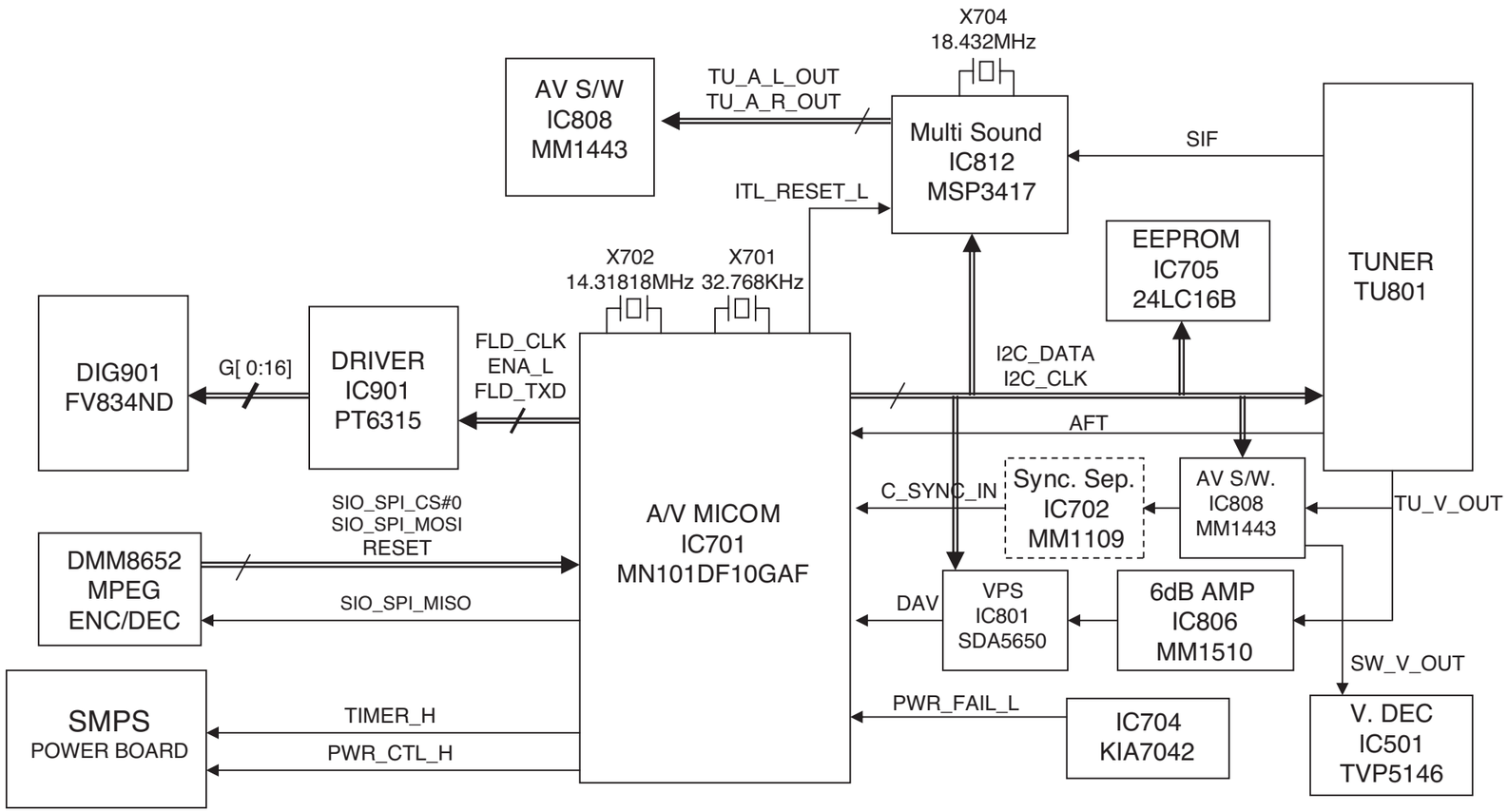
11. Audio SW Path Block Diagram



12. AUDIO IN / OUT Block Diagram

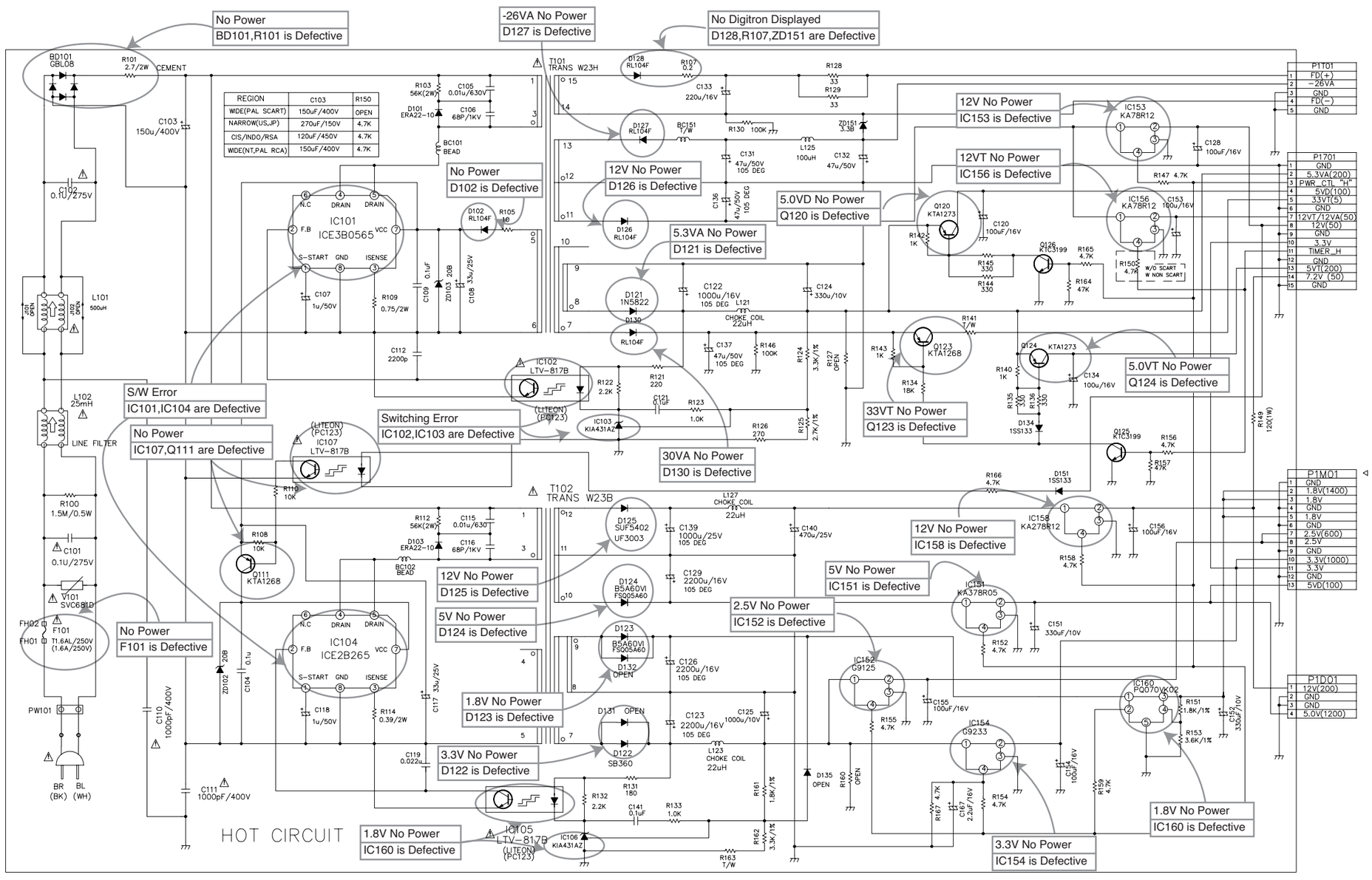


13. FLD / μ-COM / TUNER Block Diagram



CIRCUIT DIAGRAMS

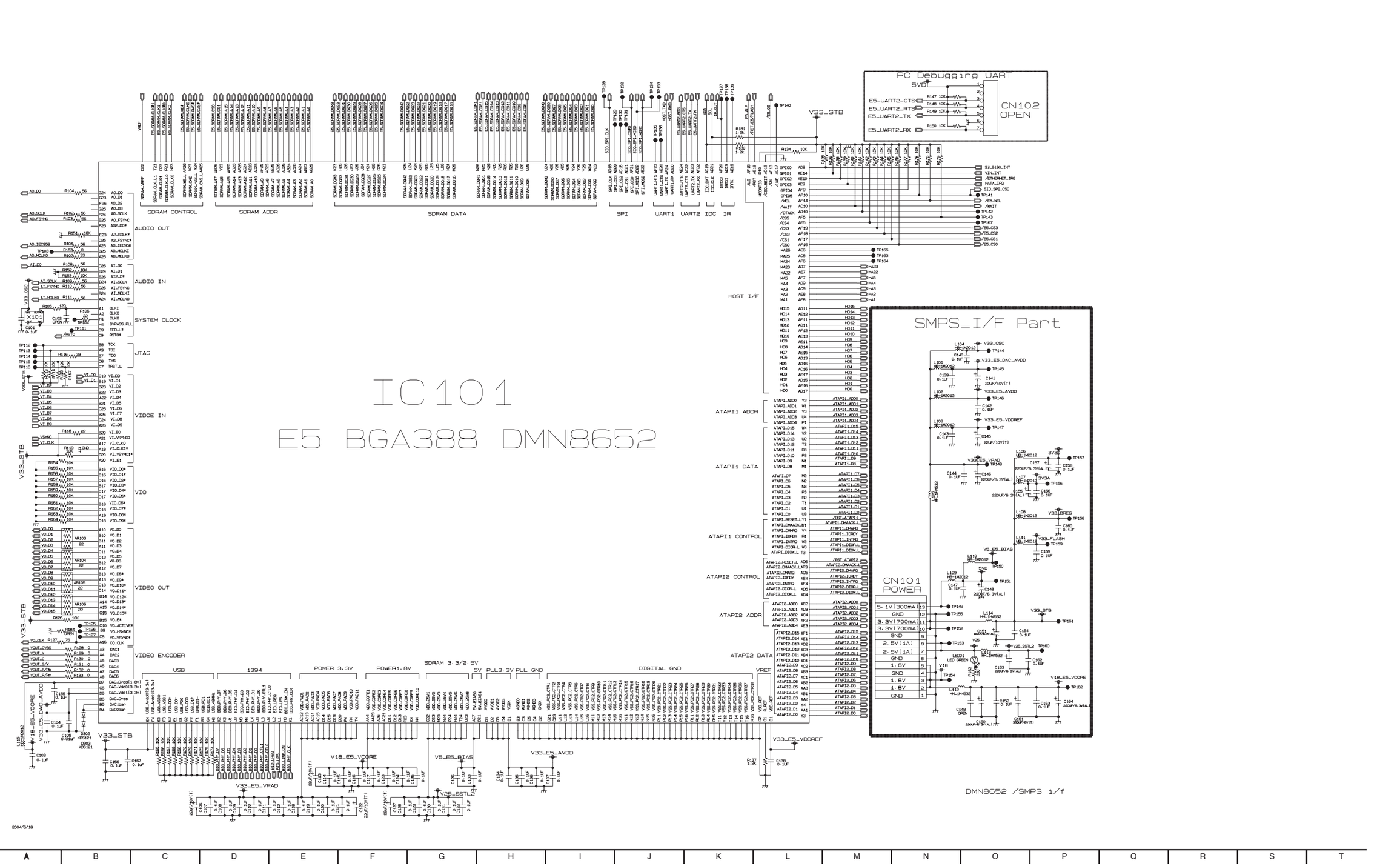
1. POWER CIRCUIT DIAGRAM



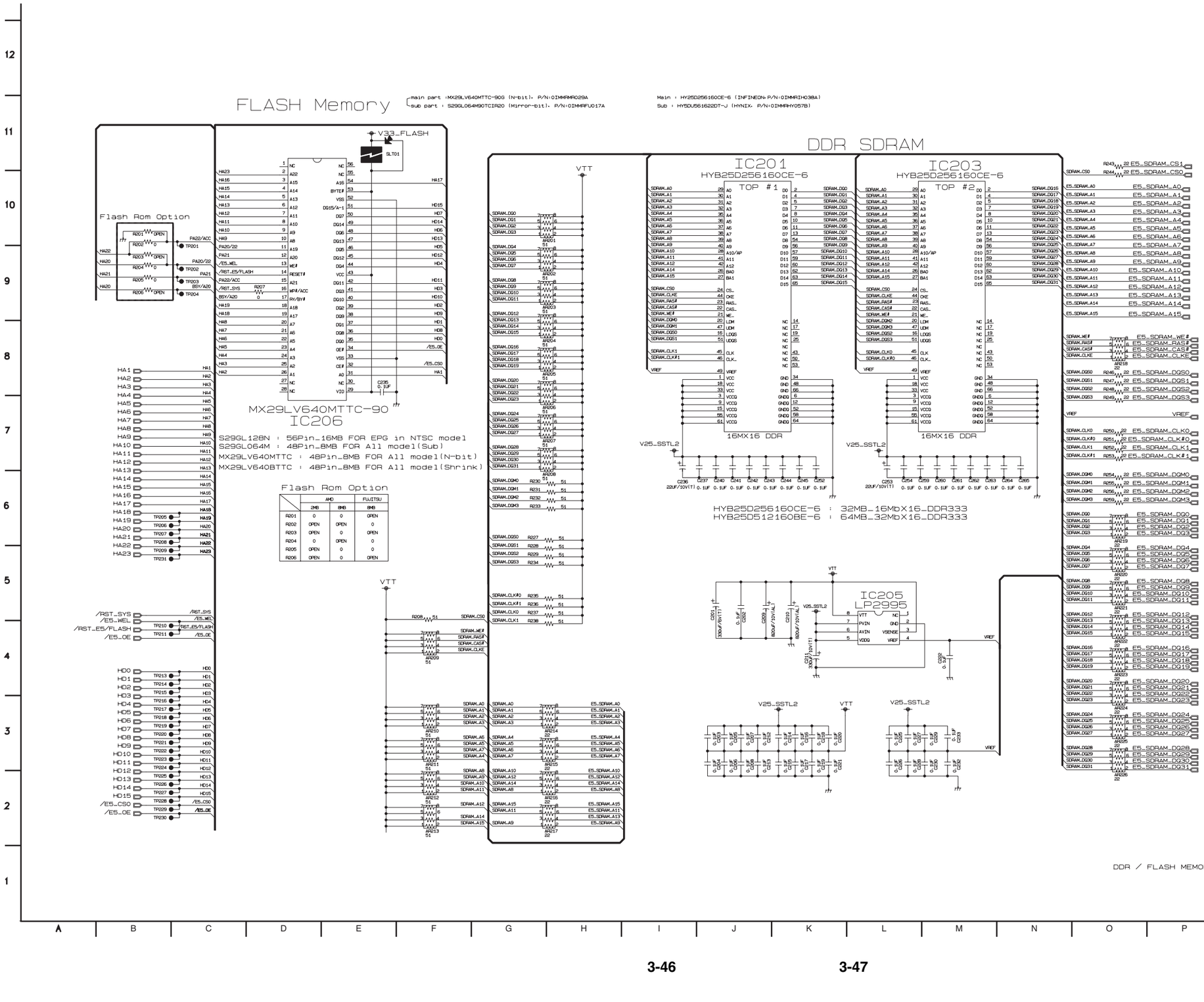
D'SCHEMATIC POWER
RH7000's HDD RECORDER

3854R17750A

2. E5 BGA, POWER, UART2 CIRCUIT DIAGRAM

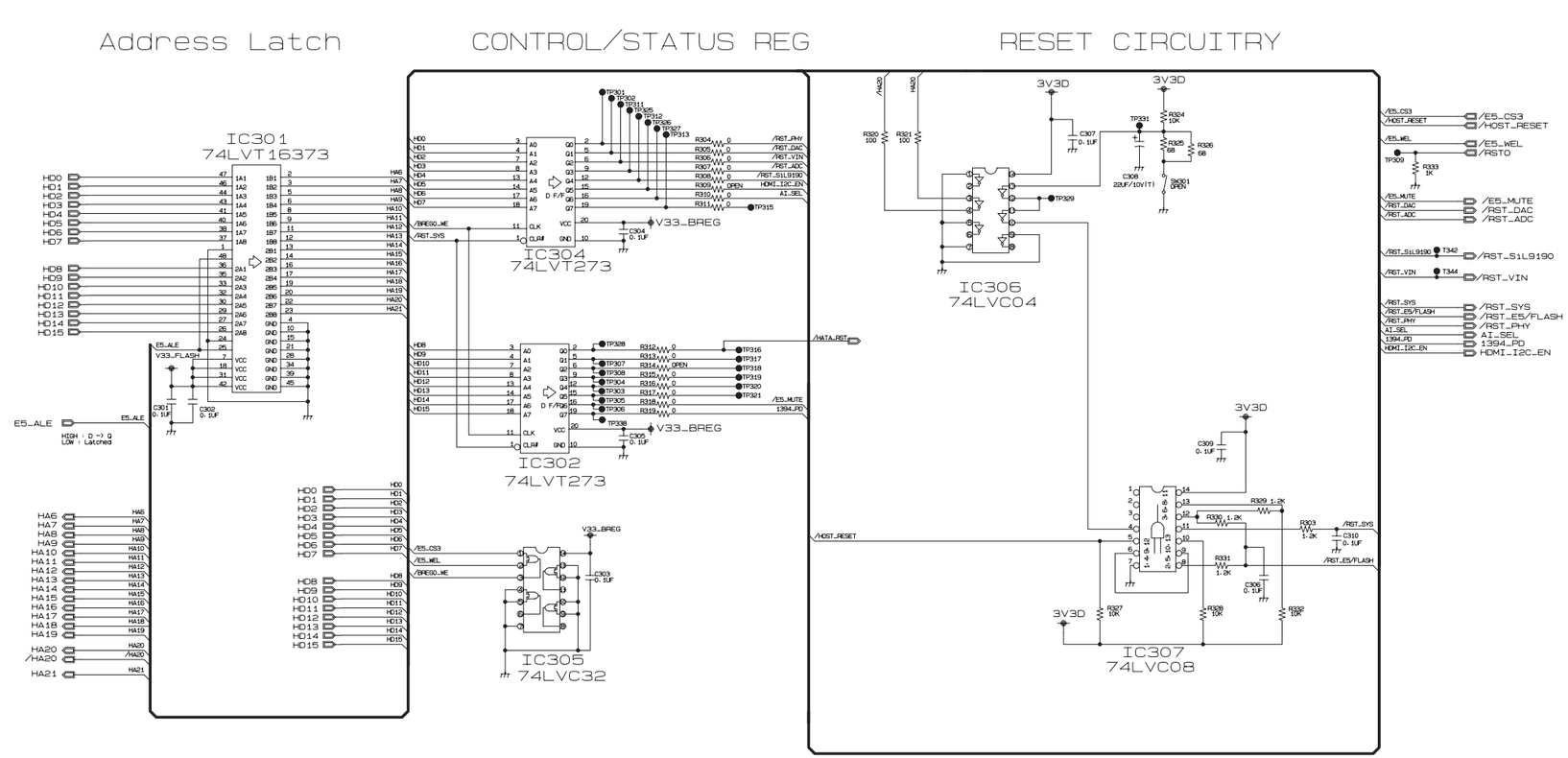


3. DDR SDRAM, FLASH CIRCUIT DIAGRAM



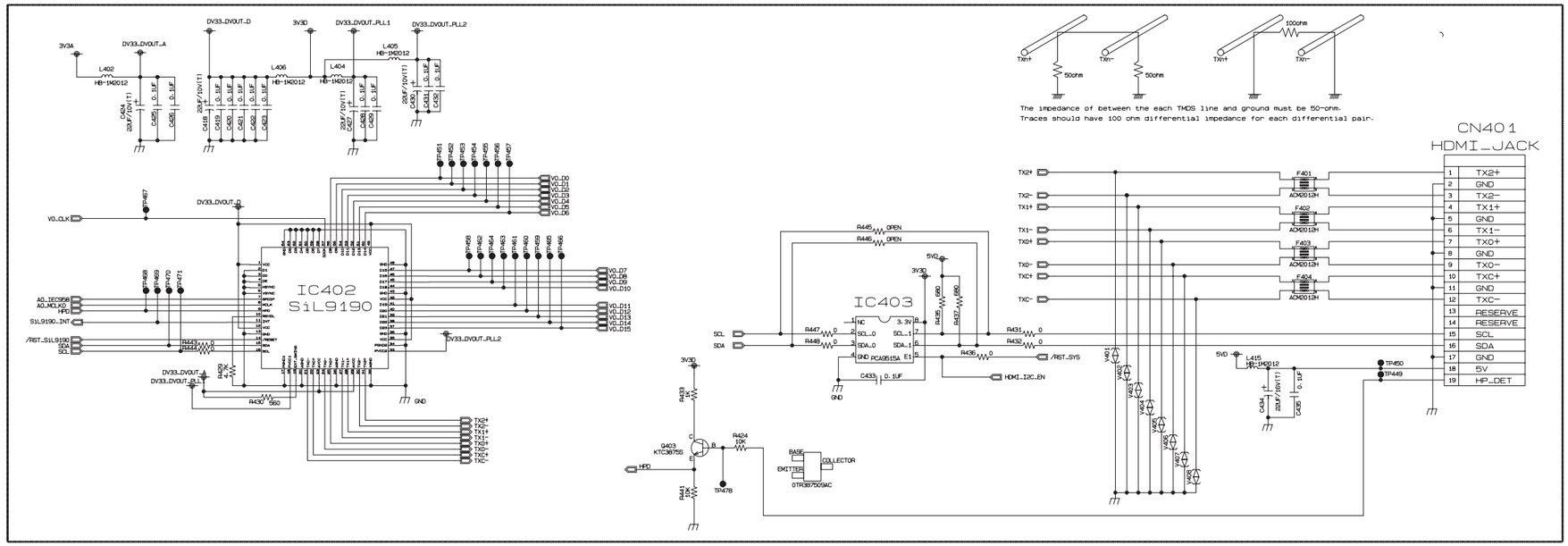
4. RST, CONTROL/STATUS REG, ADDRESS LATCH CIRCUIT DIAGRAM

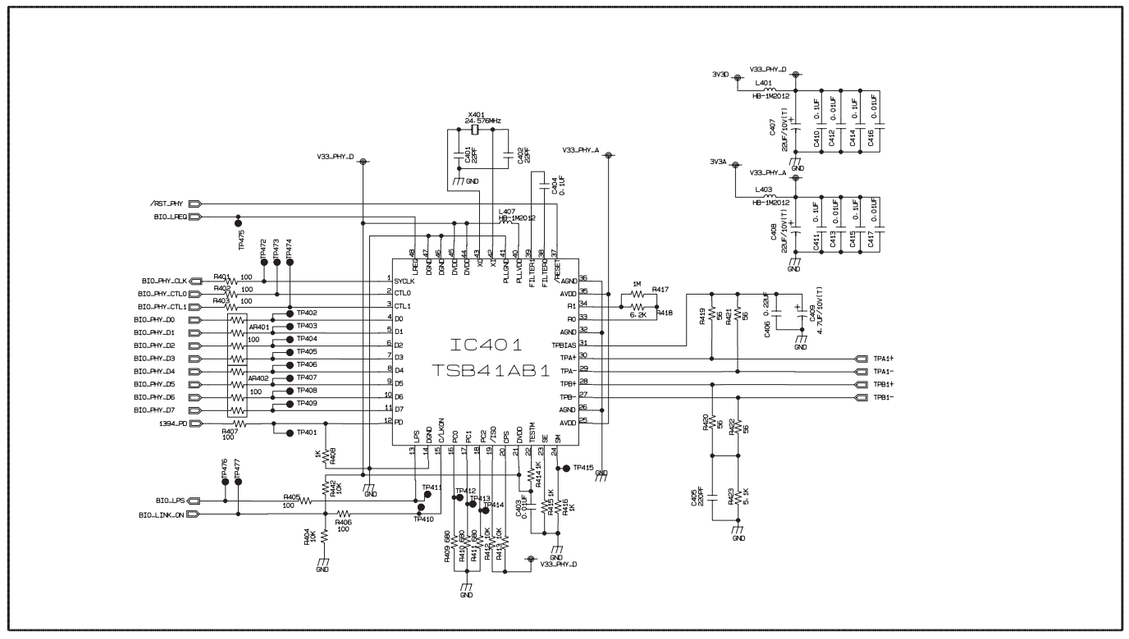
74LVT16373 : 3.3LVT 16bit Transparent D-type Latch
74LVT273 : 3.3LVT Octal D-FF
74LVC32 : Quad 2-input OR-Gate
74LVC04 : Hexa Inverter
74LVC08 : Quad 2-input AND-Gate

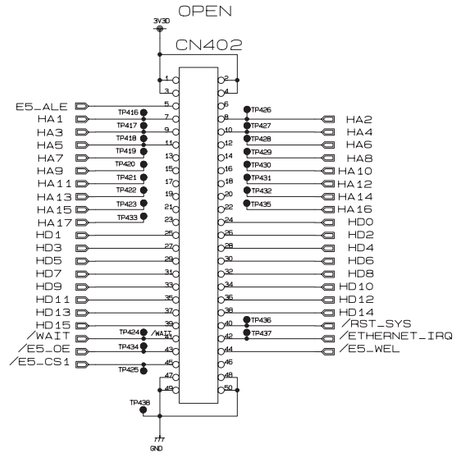


RESET / ADDRESS LATCH

5. HDMI TX / IEEE1394 CIRCUIT DIAGRAM

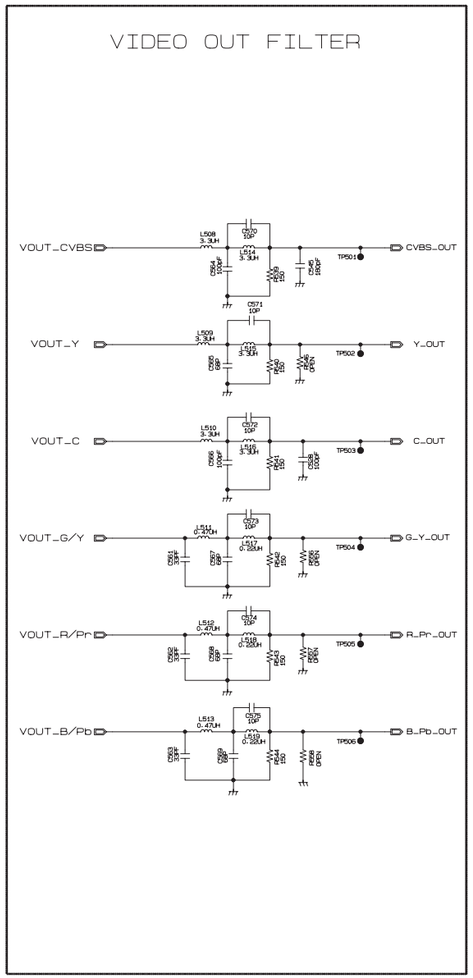


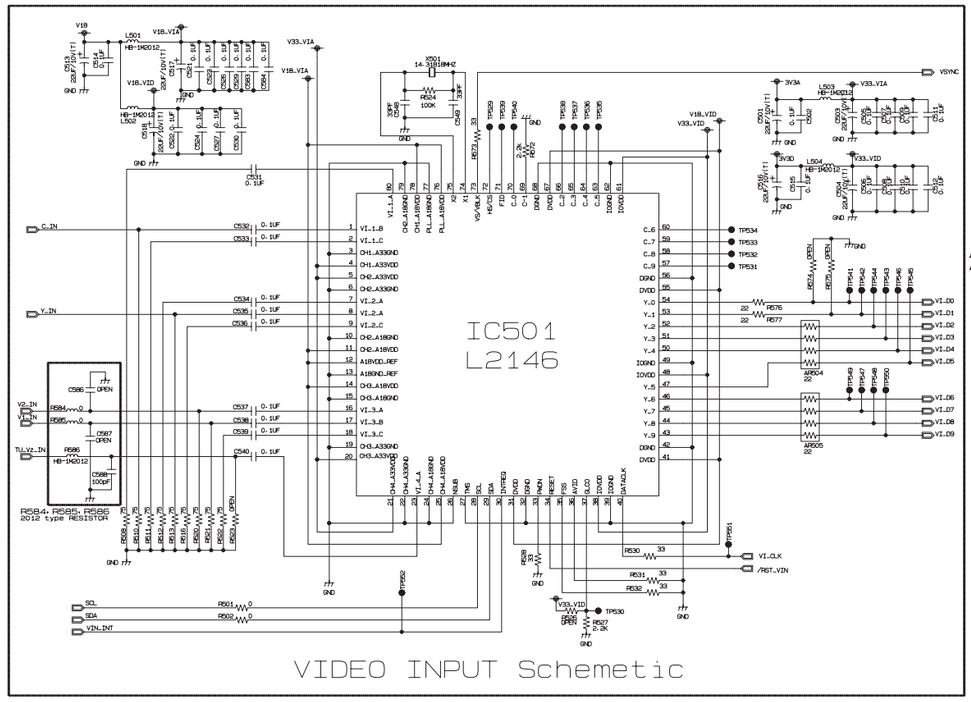


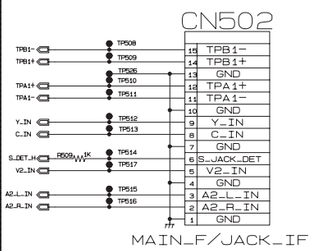


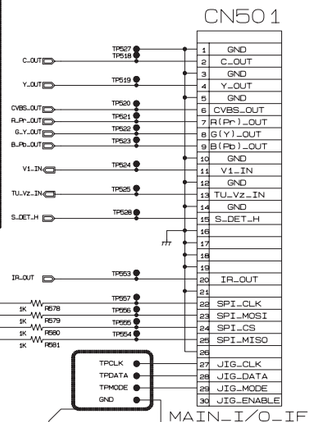
HDMI TX / IEEE1394

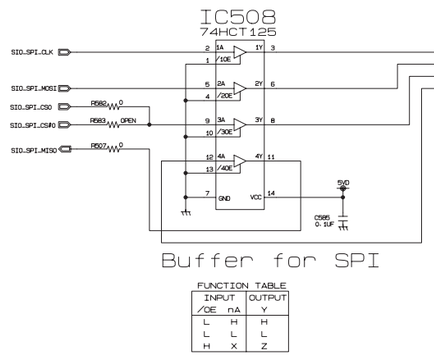
6. VIDEO IN/OUT CIRCUIT DIAGRAM





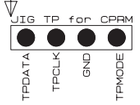






FUNCTION TABLE

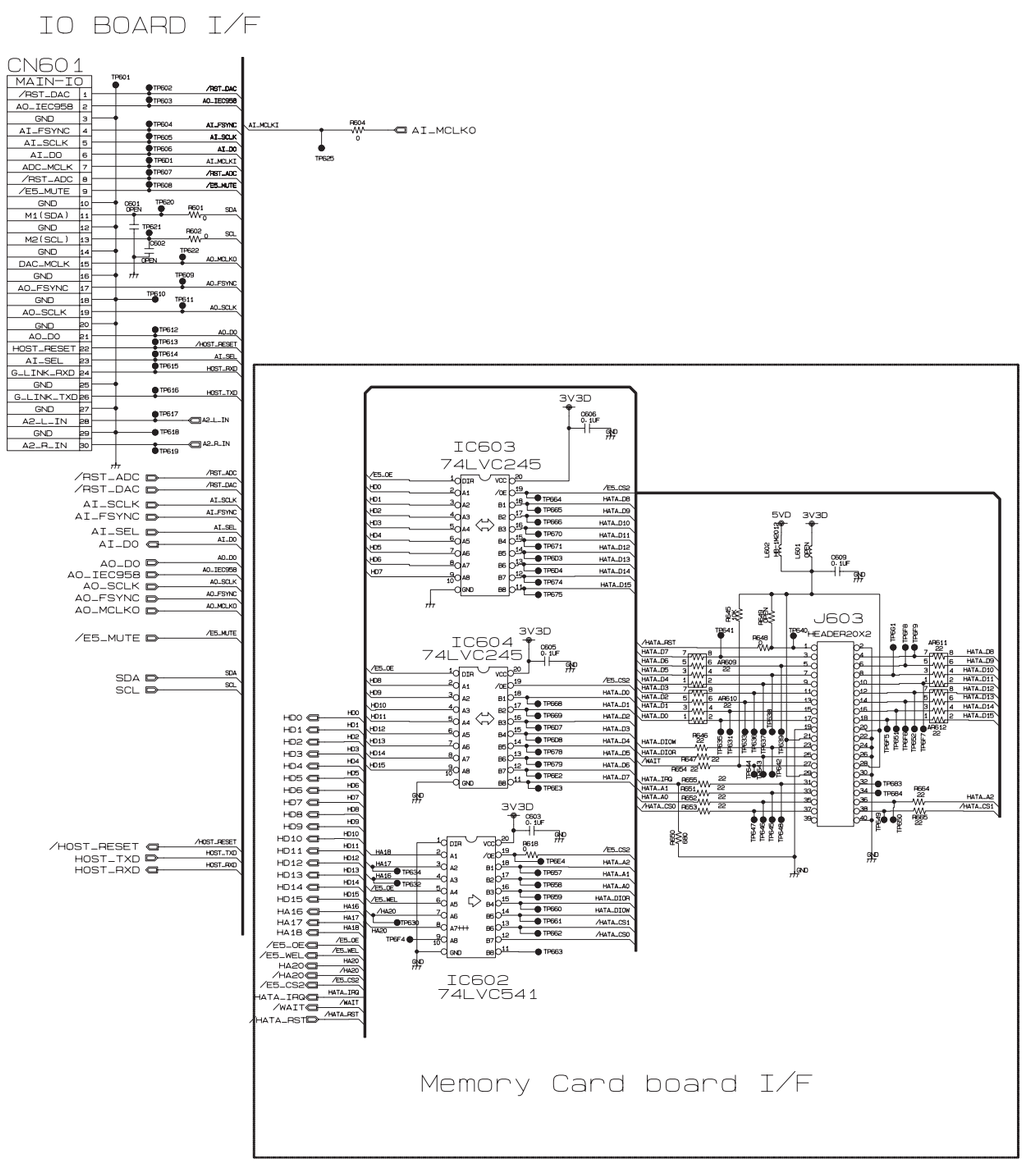
INPUT		OUTPUT
/OE	nA	Y
L	H	H
L	L	L
H	X	Z

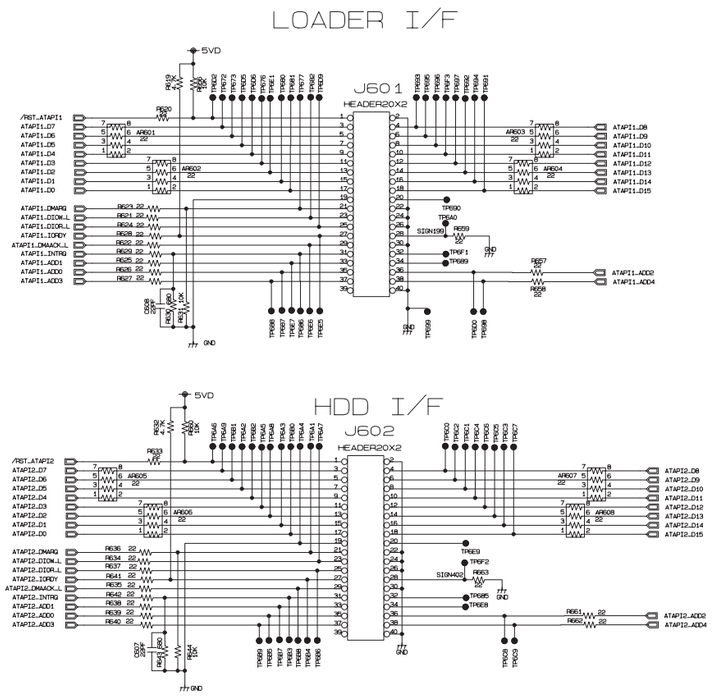


TP SIZE : 2.0 PAI
TP CLAERANCE : 2.5 mm

VIDEO DECODER

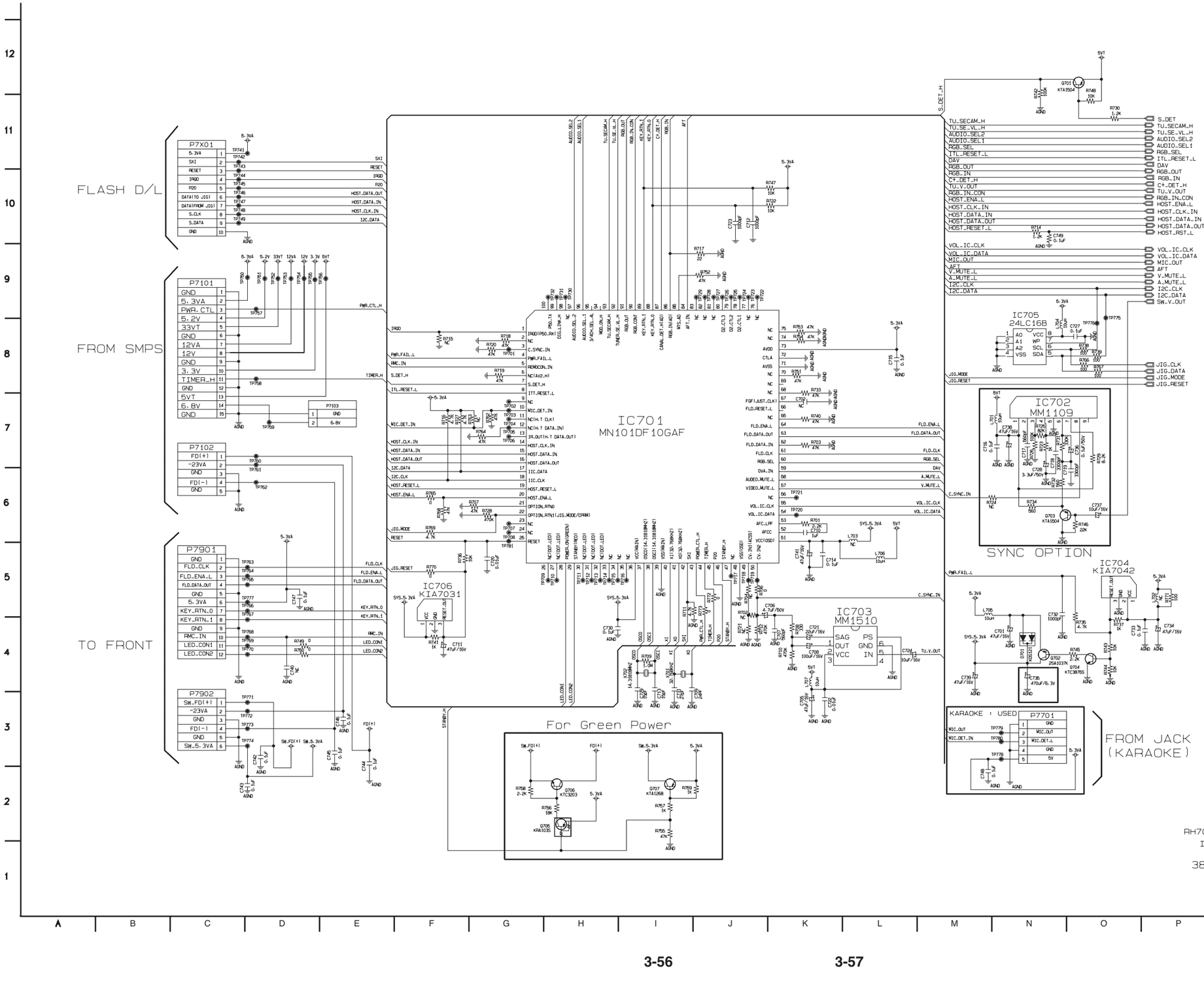
7. MEMORY, ATAPI, I/O CIRCUIT DIAGRAM



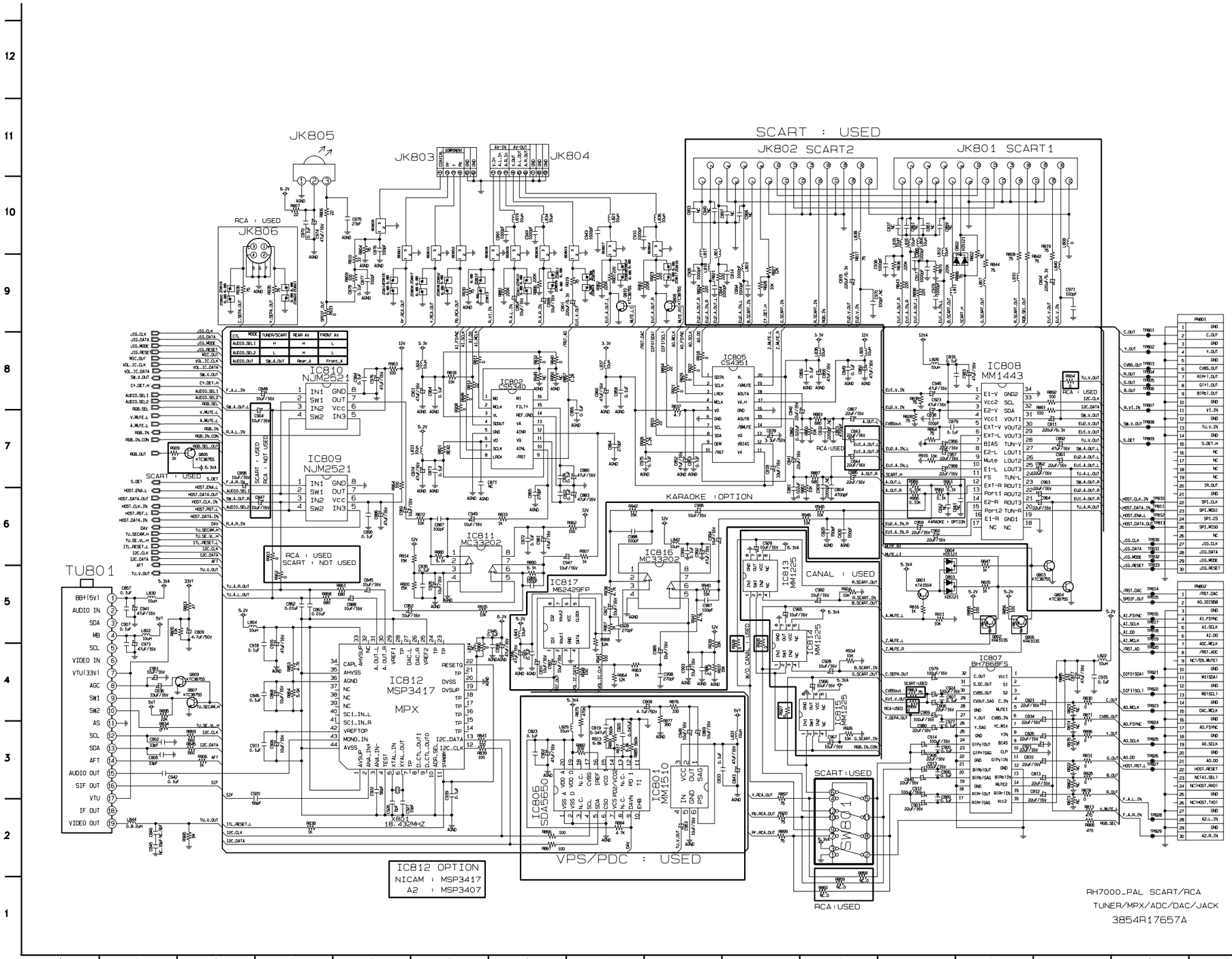



```
---PCB Information---
PCB Size : Width=218.Height=159.00
Total net count=768
Total component=643
Total pad=3195
Total none pin=465-74=391          MEMORY i/f &ATAPI & I/O i/f
Number of duplicate pin=22
Number of designed pin=377
PIN defined rate=49.1
```

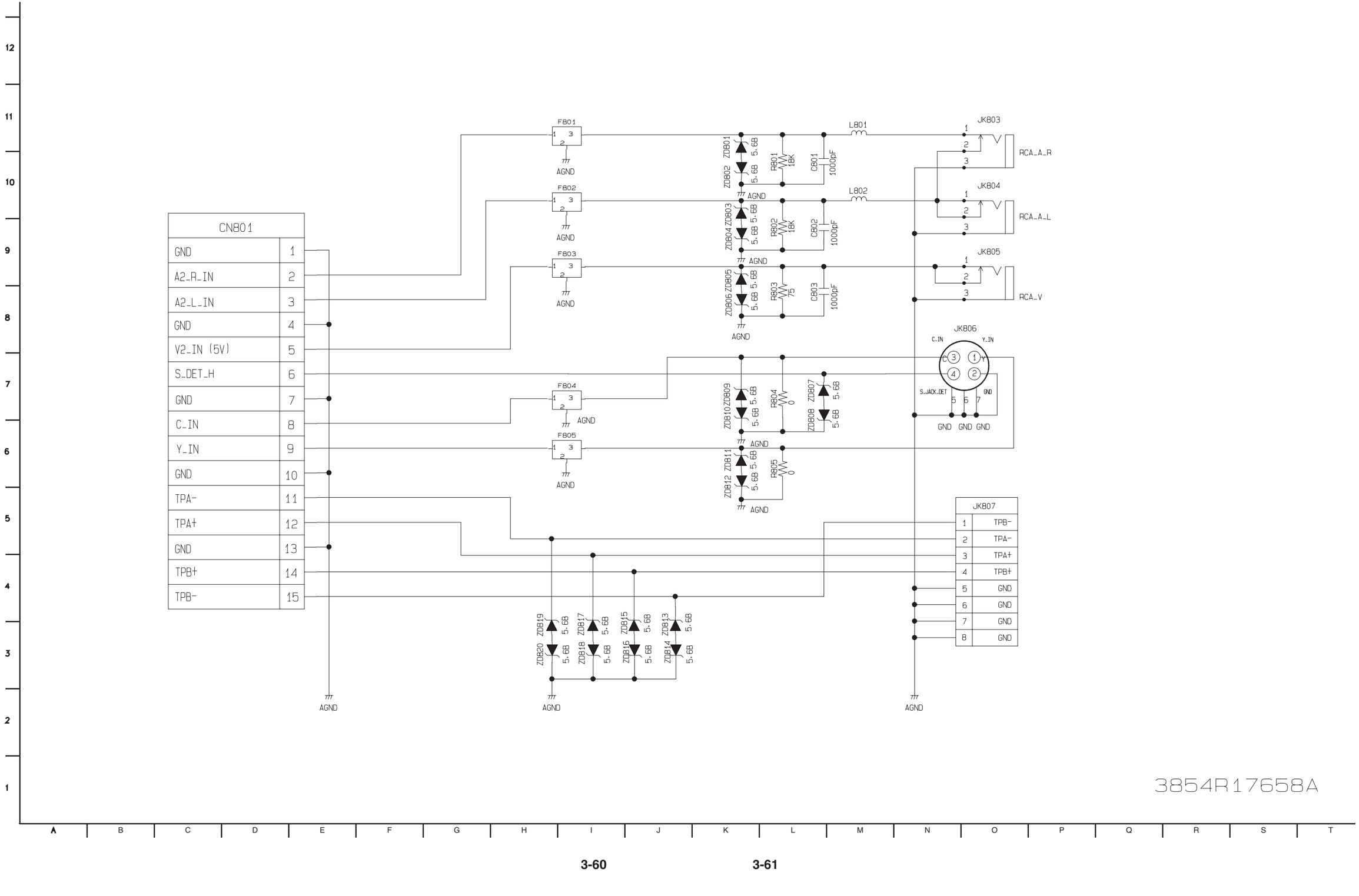
8. I/O MICOM CIRCUIT DIAGRAM



9. TUNER, MPX, ADC, DAC, JACK CIRCUIT DIAGRAM

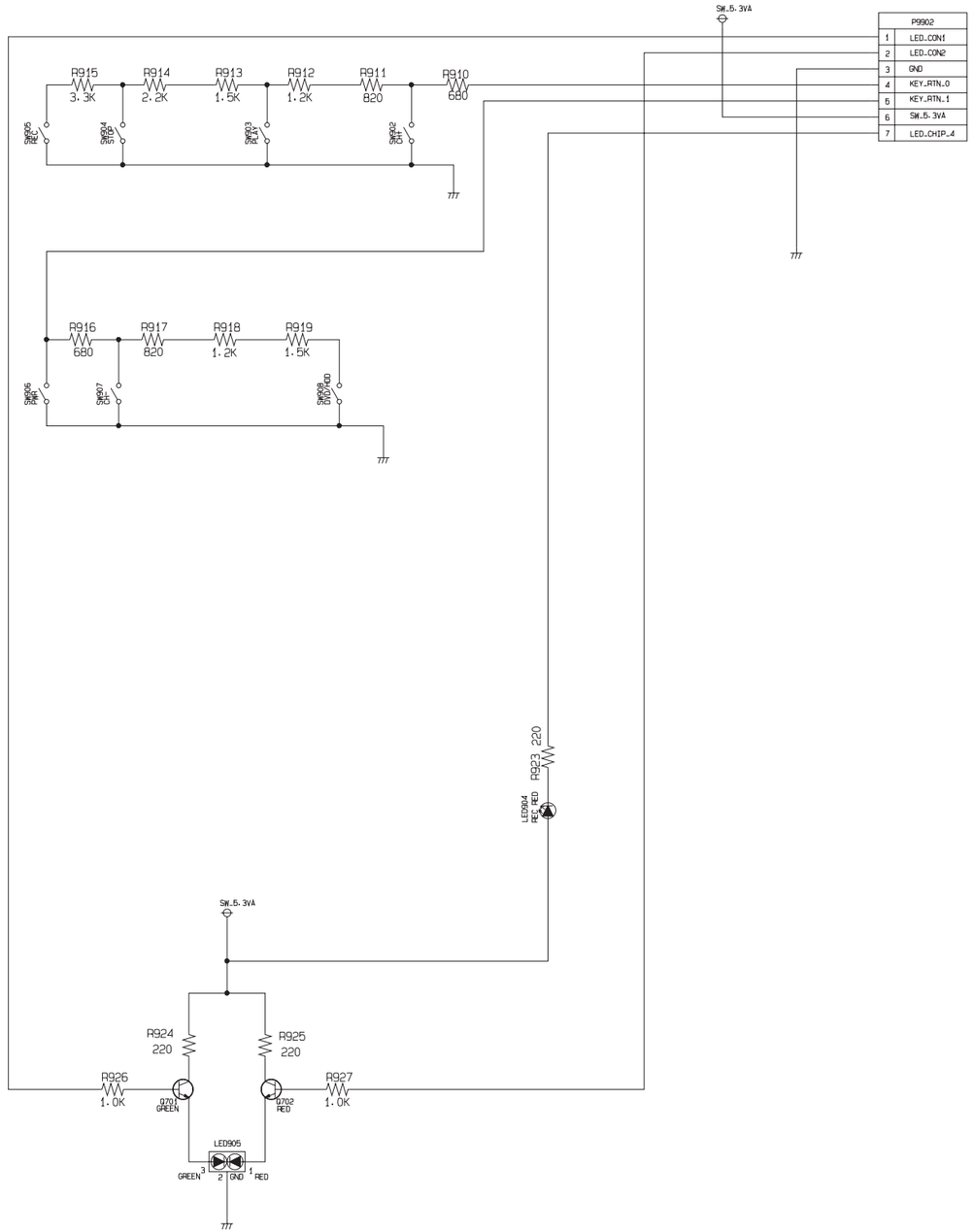


10. JACK CIRCUIT DIAGRAM



3854R17658A

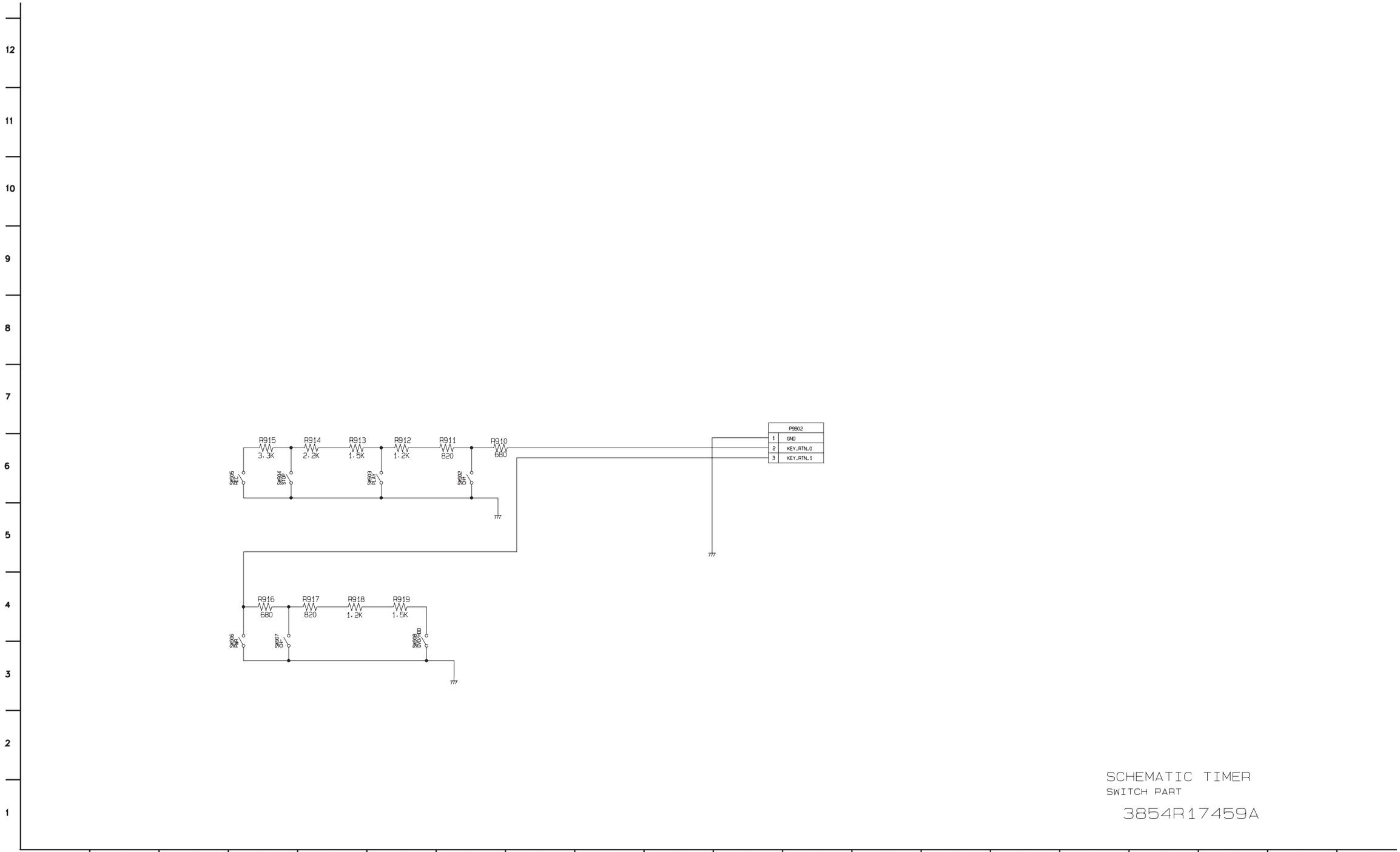
11. KEY CIRCUIT DIAGRAM (5 TOOL ONLY)



SCHEMATIC TIMER
SWITCH PART

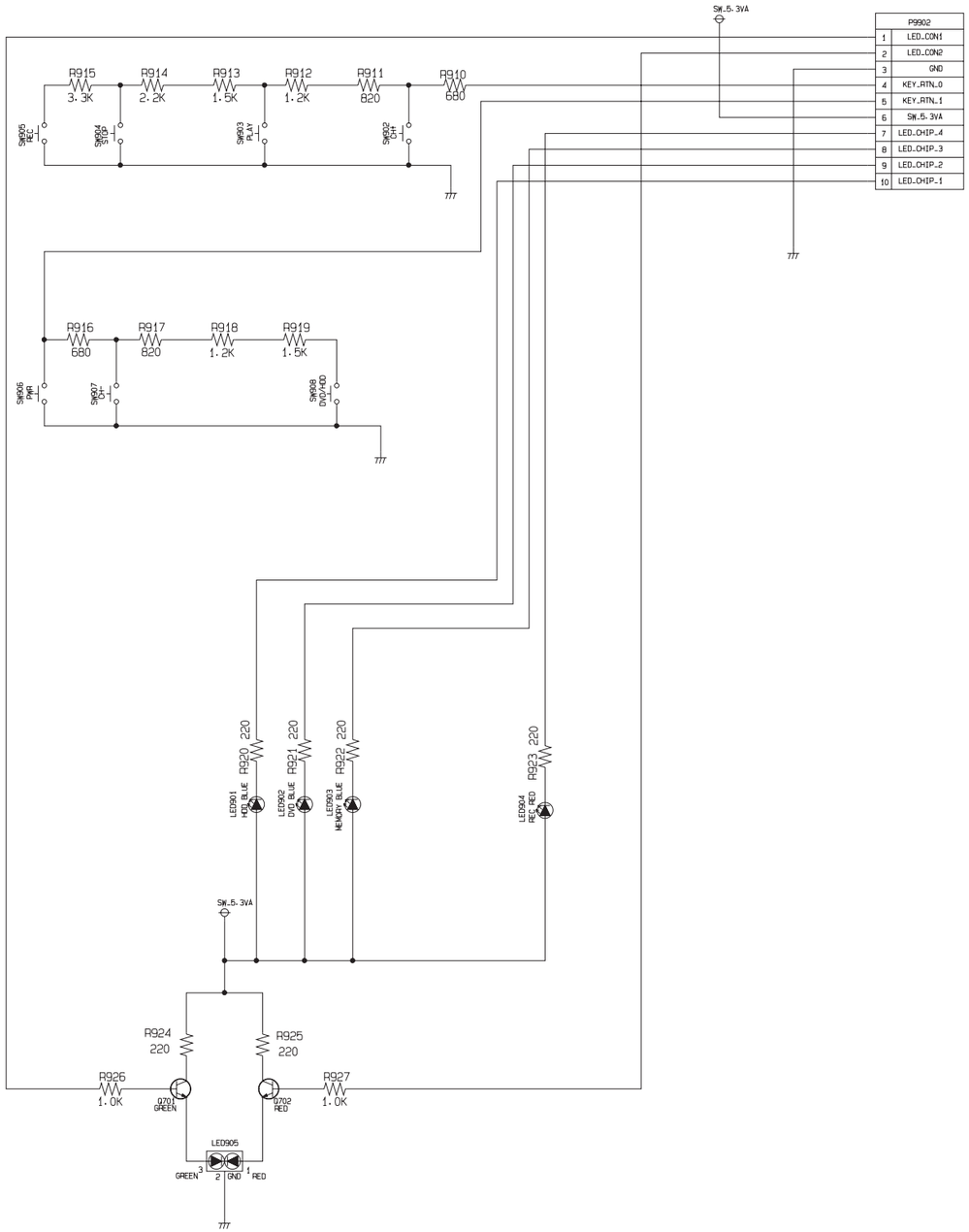
3854R17359A

12. KEY CIRCUIT DIAGRAM (6 TOOL ONLY)



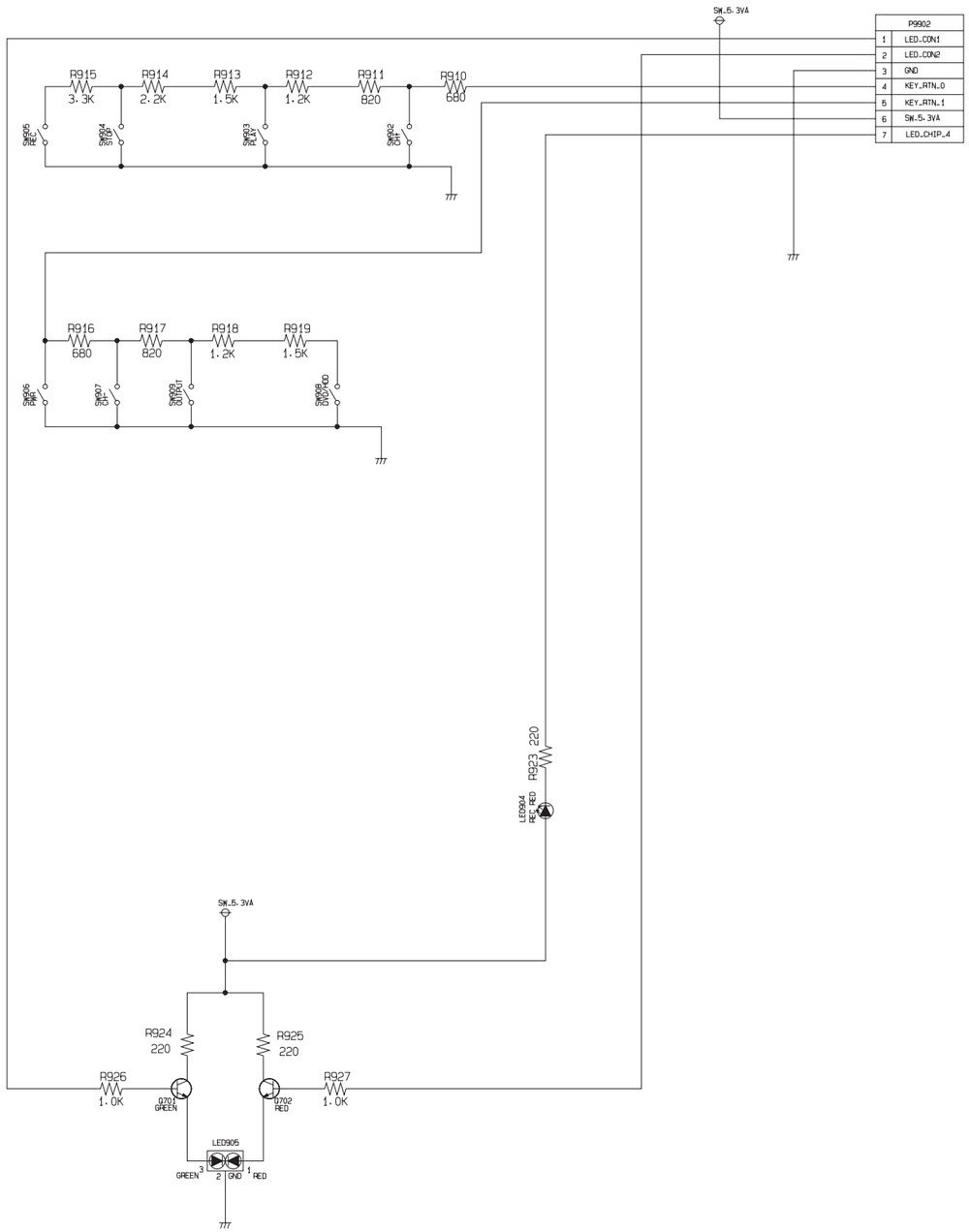
SCHEMATIC TIMER
SWITCH PART
3854R17459A

13. KEY CIRCUIT DIAGRAM (8 TOOL ONLY)



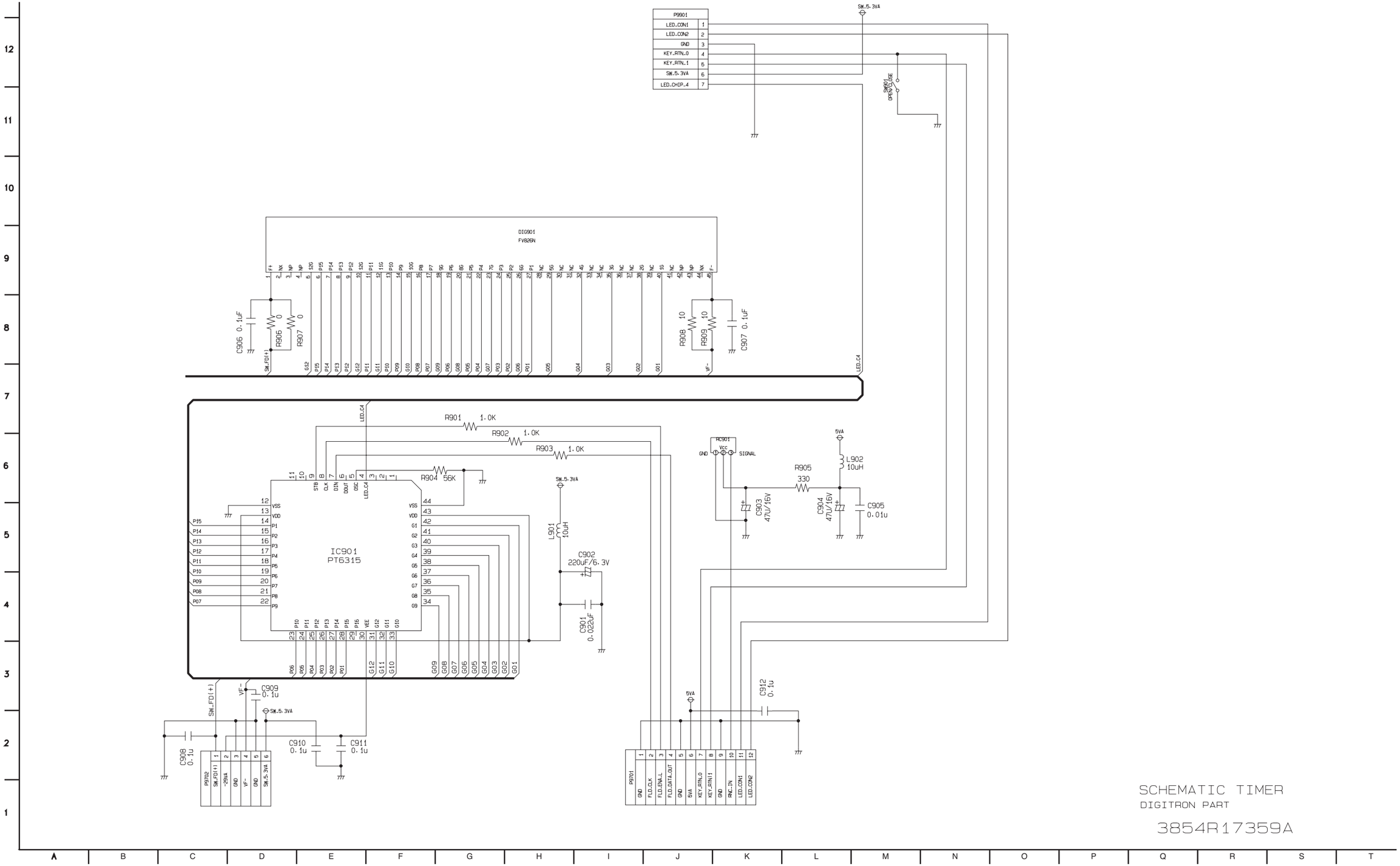
SCHEMATIC TIMER
SWITCH PART
3854R17659A

14. KEY CIRCUIT DIAGRAM (9 TOOL ONLY)



SCHEMATIC TIMER
SWITCH PART
3854R17759A

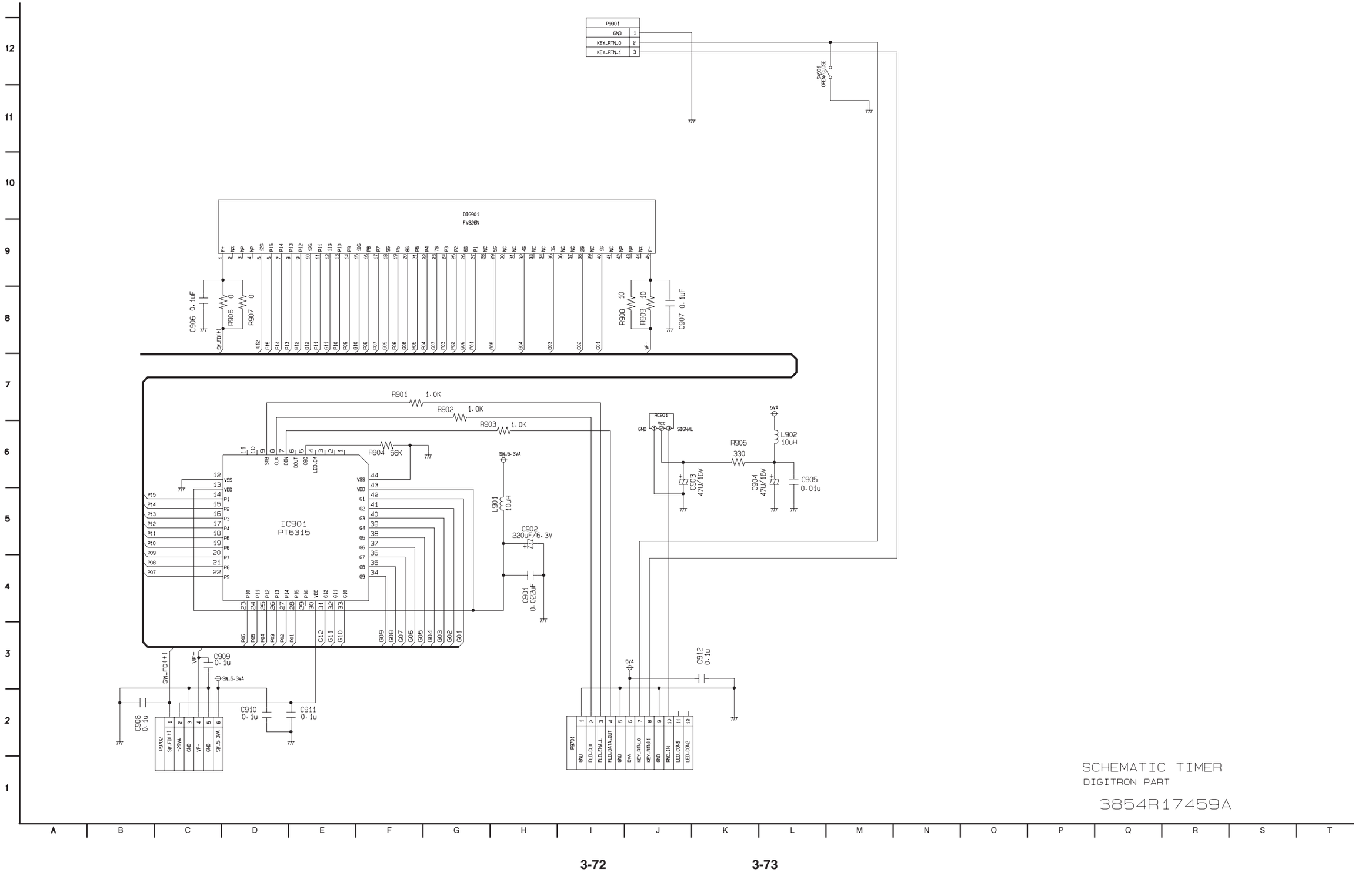
15. TIMER CIRCUIT DIAGRAM (5 TOOL ONLY)



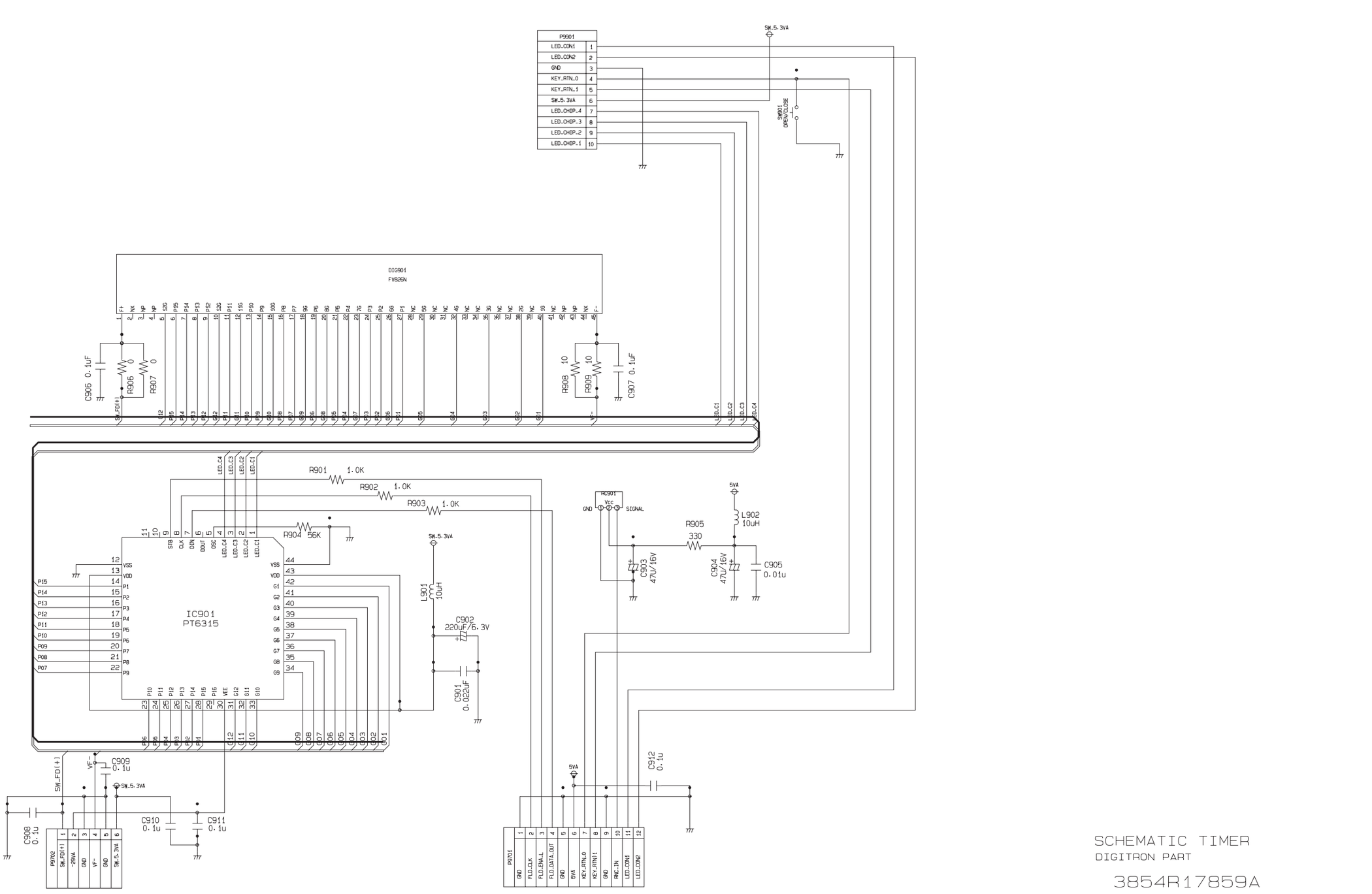
SCHEMATIC TIMER
DIGITRON PART

3854R17359A

16. TIMER CIRCUIT DIAGRAM (6 TOOL ONLY)



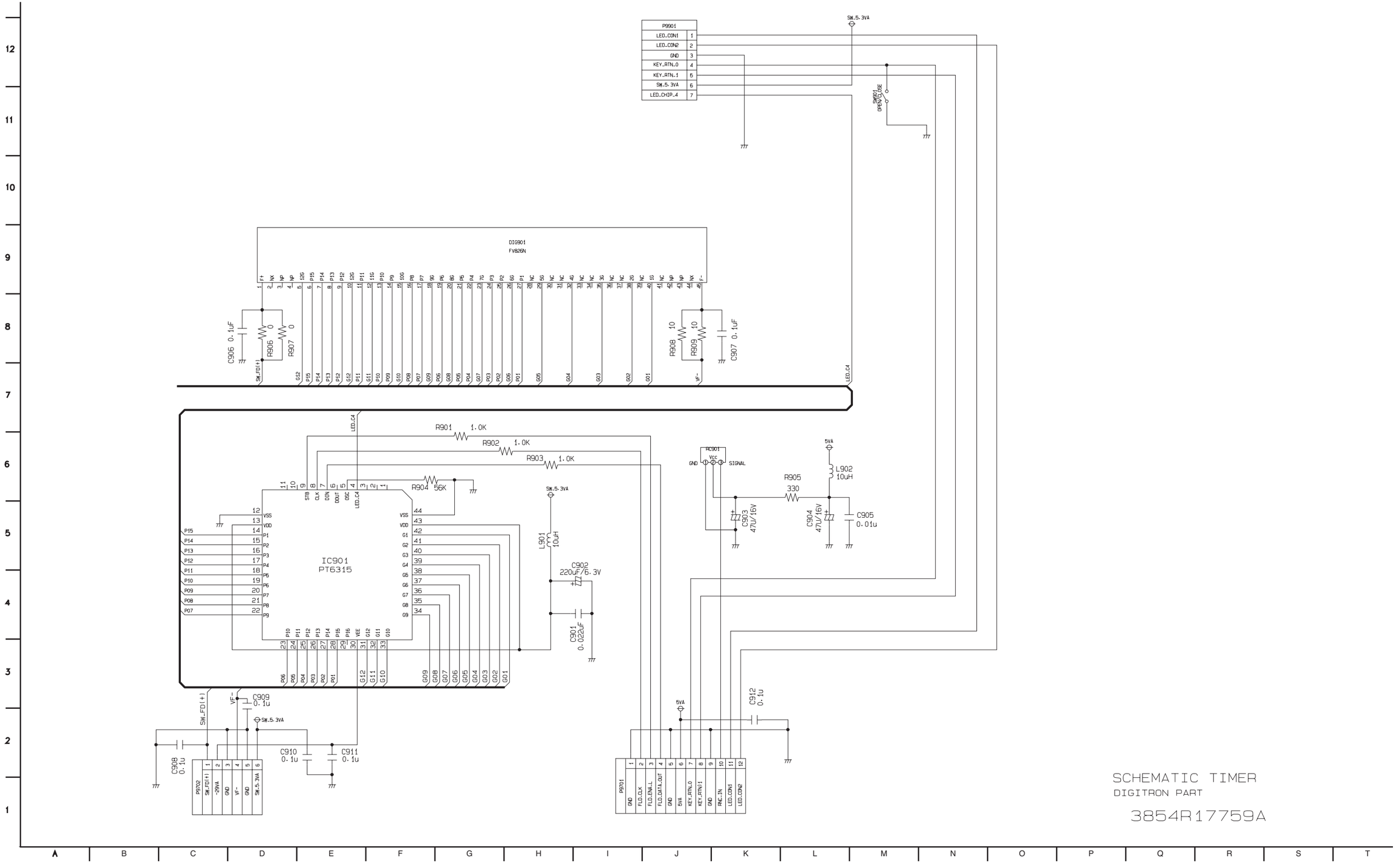
17. TIMER CIRCUIT DIAGRAM (8 TOOL ONLY)



SCHEMATIC TIMER
DIGITRON PART

3854R17859A

18. TIMER CIRCUIT DIAGRAM (9 TOOL ONLY)

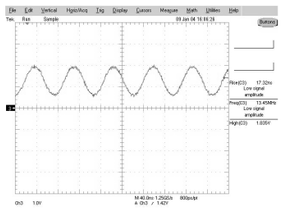


SCHEMATIC TIMER
DIGITRON PART

3854R17759A

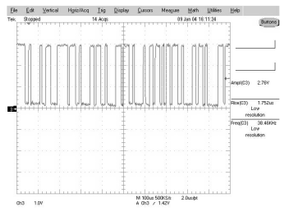
• WAVEFORMS

①



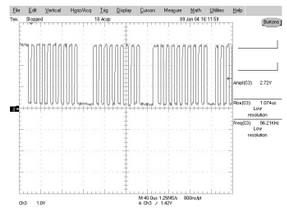
X101
27MHz

②



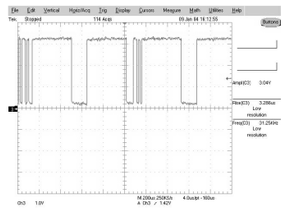
IC403
PIN3
SDA

③



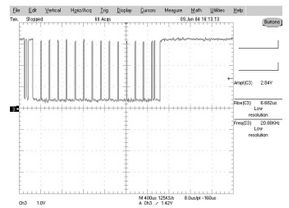
IC403
PIN2
SCL

④



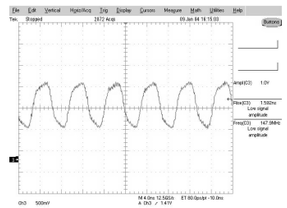
CN601
PIN24
HOST_RXD

⑤



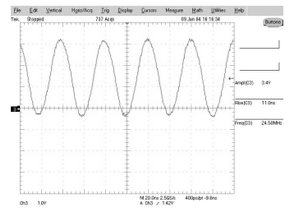
CN601
PIN26
HOST_TXD

⑥



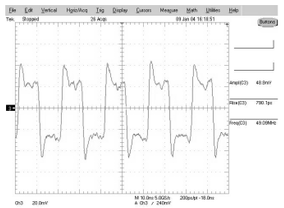
IC203
PIN45
SDRAM_CLK0

⑦



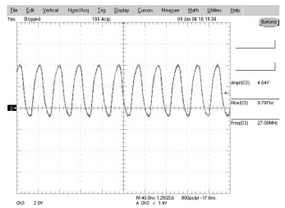
IC401
PIN43
24.576MHz

⑧



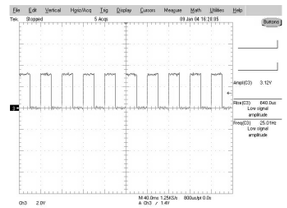
IC401
PIN1
BIO_PHY_CLK

⑨



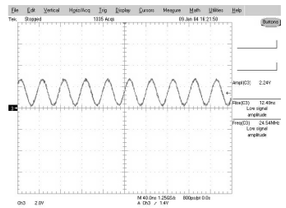
IC501
PIN40
VI_CLK

⑩



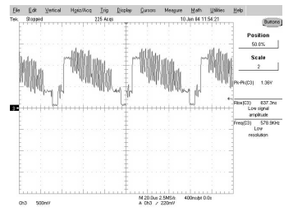
IC501
PIN73
VSYNC

⑪



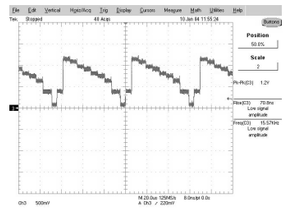
IC501
PIN75
14.31818MHz

⑫



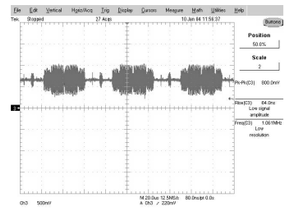
CN501
PIN6
CVBS_OUT

⑬



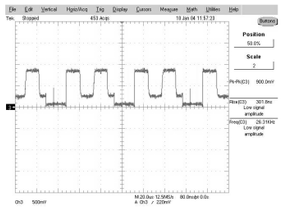
CN501
PIN4
Y_OUT

⑭



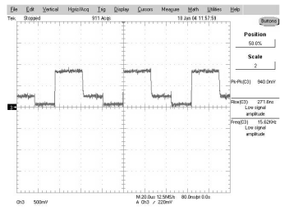
CN502
PIN2
C_OUT

⑭



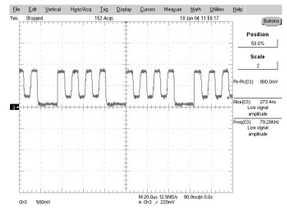
CN501
PIN7
R_Pr_OUT

⑯



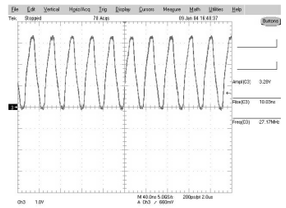
CN501
PIN8
G_Y_OUT

⑰



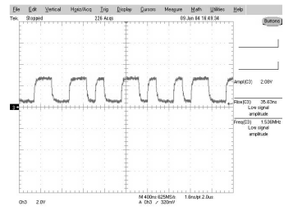
CN501
PIN9
B_Pb_OUT

⑱



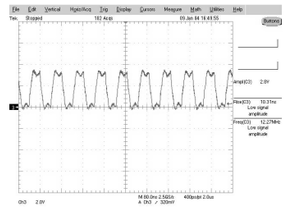
IC402
PIN52
VO_CLK

⑲



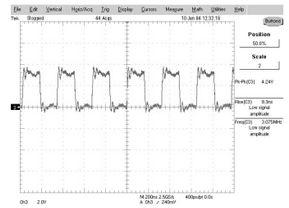
CN601
PIN2
AO_IEC958

⑳



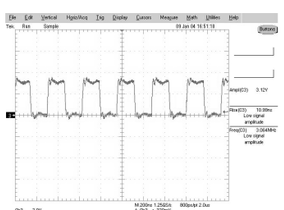
CN601
PIN15
AO_MCLK0

㉑



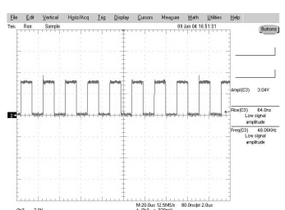
CN601
PIN5
AI_SCLK

㉒



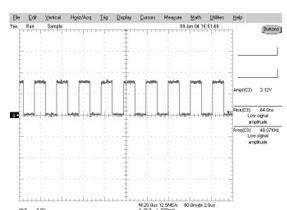
CN601
PIN19
AO_SCLK

㉓



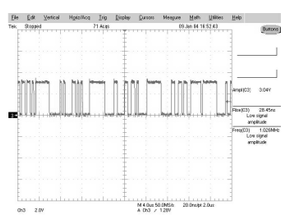
CN601
PIN4
AI_FSYNC

㉔



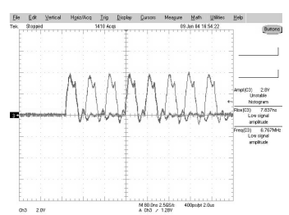
CN601
PIN17
AO_FSYNC

㉕



CN601
PIN21
AO_D0

㉖



IC501
PIN54
VI_D0

• CIRCUIT VOLTAGE CHART

MODE / PIN NO.	EE
IC101	
A1	1.66
A2	-
A3	0.55
A4	0.55
A5	0.67
A6	0.54
A7	0.66
A8	0.67
A9	2.67
A10	1.18
A11	1.32
A12	1.82
A13	1.11
A14	0.83
A15	1.08
A16	1.70
A17	1.56
A18	0.00
A19	1.07
A20	0.00
A21	3.28
A22	1.41
A23	1.70
A24	1.72
A25	1.73
A26	1.60
B1	3.34
B2	0.00
B3	0.00
B4	0.79
B5	0.79
B6	0.00
B7	2.32
B8	2.66
B9	2.95
B10	1.12
B11	1.11
B12	1.08
B13	1.21
B14	1.15
B15	3.35
B16	0.00
B17	1.11
B18	1.52
B19	1.60
B20	3.34
B21	1.68
B22	1.44
B23	1.61
B24	-
B25	2.35
B26	1.05

MODE / PIN NO.	EE
C1	1.29
C2	0.00
C3	0.00
C4	0.00
C5	0.00
C6	3.33
C7	0.00
C8	3.31
C9	0.00
C10	2.57
C11	1.55
C12	0.84
C13	1.24
C14	1.28
C15	2.20
C16	0.00
C17	1.20
C18	0.82
C19	1.43
C20	3.34
C21	0.00
C22	2.50
C23	0.00
C24	1.24
C25	1.40
C26	1.67
D1	3.34
D2	3.34
D3	3.34
D4	3.34
D5	3.34
D6	3.33
D7	1.83
D8	2.67
D9	?
D10	3.34
D11	1.83
D12	1.83
D13	1.83
D14	3.35
D15	3.35
D16	1.23
D17	1.29
D18	1.82
D19	3.35
D20	3.35
D21	5.02
D22	1.24
D23	2.50
D24	1.69
D25	-
D26	1.27
E1	0.23

MODE / PIN NO.	EE
E2	0.23
E3	0.23
E4	3.35
E23	1.68
E24	0.00
E25	1.68
E26	0.00
F1	0.23
F2	0.23
F3	0.23
F4	3.35
F23	1.83
F24	1.69
F25	-
F26	-
G1	0.00
G2	0.00
G3	0.00
G4	0.00
G23	-
G24	1.68
G25	-
G26	1.14
H1	1.71
H2	0.00
H3	
H4	0.00
H23	1.13
H24	1.12
H25	1.11
H26	1.23
J1	
J2	
J3	
J4	
J23	1.10
J24	1.21
J25	1.07
J26	1.17
K1	
K2	
K3	
K4	1.83
K23	
K24	1.16
K25	1.13
K26	1.10
L1	
L2	

MODE / PIN NO.	EE
L3	
L4	
L11	0.00
L12	0.00
L13	0.00
L14	0.00
L15	0.00
L16	0.00
L23	1.14
L24	1.21
L25	1.14
L26	1.16
M1	3.30
M2	2.20
M3	
M4	
M11	0.00
M12	0.00
M13	0.00
M14	0.00
M15	0.00
M16	0.00
M23	2.50
M24	1.17
M25	1.13
M26	
N1	
N2	
N3	
N4	1.83
N11	0.00
N12	0.00
N13	0.00
N14	0.00
N15	0.00
N16	0.00
N23	1.34
N24	2.50
N25	
N26	
P1	
P2	
P3	
P4	3.35
P11	0.00
P12	0.00
P13	0.00
P14	0.00
P15	0.00
P16	0.00
P23	1.31
P24	2.50

MODE / PIN NO.	EE
P25	
P26	
R1	
R2	
R3	
R4	3.35
R11	0.00
R12	0.00
R13	0.00
R14	0.00
R15	0.00
R16	0.00
R23	1.34
R24	2.50
R25	
R26	
T1	
T2	
T3	
T4	3.35
T11	0.00
T12	0.00
T13	0.00
T14	0.00
T15	0.00
T16	0.00
T23	1.30
T24	2.50
T25	1.14
T26	1.12
U1	
U2	
U3	
U4	
U23	2.50
U24	0.25
U25	1.13
U26	1.16
V1	
V2	
V3	
V4	
V23	1.13
V24	
V25	
V26	
W1	
W2	
W3	
W4	

MODE / PIN NO.	EE
W23	
W24	1.12
W25	1.22
W26	
Y1	
Y2	
Y3	
Y4	
Y23	-
Y24	
Y25	1.16
Y26	1.17
AA1	
AA2	
AA3	
AA4	1.83
AA23	1.83
AA24	
AA25	
AA26	
AB1	
AB2	
AB3	
AB4	
AB23	
AB24	1.22
AB25	
AB26	
AC1	
AC2	
AC3	
AC4	
AC5	
AC6	1.83
AC7	D21
AC8	
AC9	
AC10	3.87
AC11	
AC12	3.35
AC13	3.35
AC14	3.35
AC15	3.35
AC16	
AC17	
AC18	
AC19	
AC20	2.27
AC21	1.83
AC22	
AC23	

MODE / PIN NO.	EE
AC24	
AC25	
AC26	
AD1	
AD2	
AD3	
AD4	
AD5	
AD6	3.35
AD7	
AD8	0.00
AD9	
AD10	3.34
AD11	
AD12	0.00
AD13	
AD14	
AD15	
AD16	
AD17	
AD18	
AD19	
AD20	
AD21	
AD22	
AD23	
AD24	
AD25	1.23
AD26	1.22
AE1	
AE2	
AE3	
AE4	
AE5	
AE6	
AE7	0.00
AE8	
AE9	
AE10	3.34
AE11	
AE12	
AE13	
AE14	
AE15	
AE16	
AE17	
AE18	
AE19	
AE20	
AE21	
AE22	
AE23	
AE24	

MODE / PIN NO.	EE
AE25	
AE26	
AF1	
AF2	
AF3	
AF4	
AF5	
AF6	
AF7	
AF8	
AF9	
AF10	
AF11	
AF12	
AF13	
AF14	
AF15	
AF16	
AF17	
AF18	
AF19	
AF20	
AF21	
AF22	
AF23	
AF24	
AF25	
AF26	

MODE / PIN NO.	EE	PB	REC
IC202			
1	2.51	2.49	2.48
2	1.13	1.11	1.15
3	2.50	2.49	2.48
4	1.13	1.13	1.14
5	1.16	1.14	1.18
6	0.00	0.00	0.00
7	1.18	1.15	1.26
8	1.14	1.15	1.14
9	2.50	2.49	2.49
10	1.12	1.08	1.01
11	1.14	1.14	1.12
12	0.00	0.00	0.00
13	1.16	1.06	1.17
14	0.00	0.00	0.00
15	2.50	2.49	2.48
16	1.22	1.21	1.21
17	0.00	0.00	0.00
18	2.50	2.49	2.49
19	0.00	0.00	0.00
20	0.54	0.54	0.52
21	1.27	1.27	1.33
22	1.22	1.20	1.14
23	1.26	1.28	1.33
24	1.80	1.75	1.62
25	0.00	0.00	0.00
26	1.24	1.23	1.23
27	1.25	1.25	1.24
28	1.17	1.14	1.09
29	1.16	1.13	1.09
30	1.17	1.14	1.13
31	1.19	1.17	1.15
32	1.22	1.21	1.21
33	2.50	2.49	2.48
34	0.00	0.00	0.00
35	1.22	1.21	1.21
36	1.23	1.22	1.22
37	1.22	1.22	1.22
38	1.22	1.21	1.22
39	1.23	1.22	1.22
40	1.16	1.14	1.08
41	1.16	1.14	1.08
42	1.17	1.14	1.08
43	0.00	0.00	0.00
44	1.99	1.99	1.98
45	1.27	1.26	1.26
46	1.26	1.26	1.25
47	0.53	0.53	0.52
48	0.00	0.00	0.00
49	1.25	1.24	1.24
50	0.00	0.00	0.00
51	1.21	1.21	1.20
52	0.00	0.00	0.00
53	0.00	0.00	0.00
54	1.14	1.12	1.15

MODE / PIN NO.	EE	PB	REC
55	2.49	2.49	2.48
56	1.14	1.11	1.15
57	1.14	1.11	1.18
58	0.00	0.00	0.00
59	1.15	1.11	1.22
60	1.15	1.14	1.13
61	2.49	2.49	2.48
62	1.15	1.20	1.05
63	1.15	1.15	1.12
64	0.00	0.00	0.00
65	1.14	1.05	1.17
66	0.00	0.00	0.00
IC203			
1	2.49	2.49	2.48
2	1.15	1.11	1.15
3	2.49	2.49	2.48
4	1.14	1.14	1.15
5	1.16	1.15	1.22
6	0.00	0.00	0.00
7	1.17	1.11	1.21
8	1.14	1.14	1.14
9	2.49	2.49	2.48
10	1.12	1.11	1.06
11	1.13	1.12	1.14
12	0.00	0.00	0.00
13	1.15	1.10	1.17
14	0.00	0.00	0.00
15	2.49	2.49	2.48
16	1.21	1.20	1.19
17	0.00	0.00	0.00
18	2.49	2.49	2.48
19	0.00	0.00	0.00
20	0.54	0.54	0.52
21	1.26	1.27	1.33
22	1.22	1.21	1.15
23	1.26	1.28	1.33
24	1.80	1.75	1.64
25	0.00	0.00	0.00
26	1.23	1.23	1.24
27	1.24	1.25	1.24
28	1.17	1.14	1.08
29	1.16	1.13	1.08
30	1.17	1.14	1.13
31	1.19	1.17	1.15
32	1.22	1.21	1.21
33	1.26	1.28	1.33
34	1.22	1.21	1.15
35	1.26	1.28	1.33
36	1.80	1.75	1.64
37	0.00	0.00	0.00
38	1.23	1.23	1.24
39	1.24	1.25	1.24
40	1.17	1.14	1.08
41	1.16	1.13	1.08
42	1.17	1.14	1.13
43	1.19	1.17	1.15
44	1.22	1.21	1.21
45	2.49	2.49	2.48
46	0.00	0.00	0.00
47	1.22	1.22	1.21
48	1.23	1.22	1.21
49	1.22	1.22	1.22
50	1.22	1.21	1.22
51	1.23	1.22	1.22
52	1.16	1.14	1.08
53	1.17	1.15	1.08
54	1.17	1.14	1.09

MODE / PIN NO.	EE	PB	REC
43	0.00	0.00	0.00
44	1.99	1.99	1.99
45	1.26	1.26	1.27
46	1.26	1.26	1.26
47	0.53	0.53	0.52
48	0.00	0.00	0.00
49	1.25	1.24	1.24
50	0.00	0.00	0.00
51	1.21	1.19	1.19
52	0.00	0.00	0.00
53	0.00	0.00	0.00
54	1.13	1.10	1.15
55	2.49	2.49	2.48
56	1.14	1.10	1.15
57	1.12	1.07	1.17
58	0.00	0.00	0.00
59	1.14	1.08	1.22
60	1.19	1.19	1.17
61	2.49	2.49	2.48
62	1.09	1.04	1.01
63	1.12	1.10	1.11
64	0.00	0.00	0.00
65	1.16	1.09	1.18
66	0.00	0.00	0.00
IC205			
1	2.49	2.49	2.48
2	2.49	2.49	2.48
3	2.49	2.49	2.48
4	1.24	1.23	1.23
5	0.00	0.00	0.00
6	0.00	0.00	0.00
7	1.24	1.23	1.23
8	1.25	1.24	1.24
IC206			
1	0.00	0.00	0.00
2	0.00	0.00	0.00
3	0.04	0.04	0.78
4	0.04	0.04	0.04
5	0.04	0.04	0.04
6	0.04	0.04	0.04
7	0.04	0.04	0.04
8	0.04	0.04	0.04
9	0.04	0.04	0.04
10	0.04	0.04	0.04
11	3.35	3.35	3.35
12	0.04	0.04	0.04
13	3.35	3.35	3.35
14	3.35	3.35	3.35
15	0.00	0.00	0.00
16	3.35	3.35	3.35
17	0.02	0.04	0.04
18	0.04	0.04	0.04
19	3.35	3.35	3.35
20	0.04	0.04	0.04
21	0.04	0.04	0.04

MODE / PIN NO.	EE	PB	REC
22	0.04	0.04	0.04
23	0.00	0.00	0.00
24	0.00	0.00	0.00
25	0.00	0.00	0.00
26	0.00	0.00	0.00
27	0.00	0.00	0.00
28	0.00	0.00	0.00
29	3.35	3.35	3.35
30	0.00	0.00	0.00
31	0.00	0.00	0.00
32	3.35	3.35	3.35
33	0.00	0.00	0.00
34	3.35	3.35	3.35
35	0.00	0.00	0.00
36	3.30	2.96	3.26
37	0.00	0.00	0.00
38	0.00	0.00	0.00
39	0.00	0.00	0.00
40	0.00	0.00	0.00
41	0.00	0.00	0.00
42	0.00	0.00	0.00
43	3.35	3.35	3.35
44	0.00	0.00	0.00
45	3.33	2.96	2.98
46	0.00	0.00	0.00
47	0.00	0.00	0.00
48	0.00	0.00	0.00
49	3.35	2.94	2.95
50	0.00	0.00	0.00
51	0.00	0.00	0.00
52	0.00	0.00	0.00
53	3.35	3.35	3.35
54	3.35	3.35	3.35
55	0.00	0.00	0.00
56	0.00	0.00	0.00
IC301			
1	0.00	0.00	0.00
2	0.04	0.04	0.04
3	0.04	0.04	0.04
4	0.00	0.00	0.00
5	0.04	0.04	0.04
6	0.04	0.04	0.04
7	3.35	3.35	3.35
8	0.04	0.04	0.04
9	0.04	0.04	0.04
10	0.00	0.00	0.00
11	0.04	0.04	0.04
12	0.04	0.04	0.04
13	0.04	0.04	0.04
14	0.04	0.04	0.04
15	0.00	0.00	0.00
16	0.04	0.04	0.04
17	3.35	3.35	3.35
18	3.35	3.35	3.35
19	3.35	3.35	3.35

MODE / PIN NO.	EE	PB	REC
20	0.04	0.04	0.04
21	0.00	0.00	0.00
22	3.35	3.35	3.35
23	0.04	0.04	0.04
24	0.00	0.00	0.00
25	0.00	0.00	0.00
26	0.00	0.00	0.00
27	2.98	3.25	3.30
28	0.00	0.00	0.00
29	0.00	0.00	0.00
30	3.29	3.25	3.11
31	3.35	3.35	3.35
32	0.00	0.00	0.00
33	0.00	0.00	0.00
34	0.00	0.00	0.00
35	0.00	0.00	0.00
36	2.99	2.98	2.99
37	0.00	0.00	0.00
38	0.00	0.00	0.00
39	0.00	0.00	0.00
40	0.00	0.00	0.00
41	0.00	0.00	0.00
42	3.35	3.35	3.35
43	0.00	0.00	0.00
44	0.00	0.00	0.00
45	0.00	0.00	0.00
46	0.00	0.00	0.00
47	0.00	0.00	0.00
48	0.00	0.00	0.00
IC302			
1	3.35	3.35	3.35
2	3.35	3.35	3.35
3	2.99	2.99	3.00
4	0.00	0.00	0.00
5	0.00	0.00	0.00
6	3.35	3.35	3.35
7	0.00	0.00	0.00
8	0.00	0.00	0.00
9	3.35	3.35	3.35
10	0.00	0.00	0.00
11	3.35	3.35	3.35
12	0.00	0.00	0.00
13	2.99	2.95	2.99
14	0.00	0.00	0.00
15	0.00	0.00	0.00
16	0.00	0.00	0.00
17	2.99	2.98	2.96
18	0.00	0.00	0.00
19	0.00	0.00	0.00
20	3.35	3.35	3.35
IC304			
1	3.35	3.35	3.35
2	3.35	3.35	3.35
3	0.00	0.00	0.00
4	0.00	0.00	0.00

MODE / PIN NO.	EE	PB	REC
5	3.35	3.35	3.35
6	3.35	3.35	3.35
7	0.00	0.00	0.00
8	0.00	0.00	0.00
9	3.35	3.35	3.35
10	0.00	0.00	0.00
11	3.35	3.35	3.35
12	3.35	3.35	3.35
13	0.00	0.00	0.00
14	0.00	0.00	0.00
15	3.35	3.35	3.35
16	0.00	0.00	0.00
17	0.00	0.00	0.00
18	0.00	0.00	0.00
19	0.00	0.00	0.00
20	3.35	3.35	3.35
IC305			
1	3.35	3.35	3.35
2	3.35	3.35	3.35
3	3.35	3.35	3.35
4	0.00	0.00	0.00
5	0.00	0.00	0.00
6	0.00	0.00	0.00
7	0.00	0.00	0.00
8	0.00	0.00	0.00
9	0.00	0.00	0.00
10	0.00	0.00	0.00
11	0.00	0.00	0.00
12	0.00	0.00	0.00
13	0.00	0.00	0.00
14	3.35	3.35	3.35
IC306			
1	0.00	0.00	0.00
2	3.35	3.35	3.34
3	3.35	3.35	3.35
4	0.00	0.00	0.00
5	0.00	0.00	0.00
6	3.35	3.35	3.35
7	0.00	0.00	0.00
8	3.35	3.35	3.34
9	0.00	0.00	0.00
10	3.35	3.35	3.34
11	0.00	0.00	0.00
12	0.00	0.00	0.00
13	3.34	3.34	3.33
14	3.34	3.35	3.34
IC307			
1	0.00	0.00	0.00
2	0.00	0.00	0.00
3	0.00	0.00	0.00
4	3.35	3.35	3.34
5	5.11	5.11	5.11
6	3.35	3.35	3.34
7	0.00	0.00	0.00
8	3.35	3.35	3.34

MODE / PIN NO.	EE	PB	REC
9	3.35	3.35	3.34
10	3.35	3.35	3.34
11	3.35	3.35	3.34
12	3.35	3.35	3.34
13	3.35	3.35	3.34
14	3.35	3.35	3.34
IC501			
1	0.00	0.00	0.00
2	0.00	0.00	0.00
3	0.00	0.00	0.00
4	3.35	3.35	3.35
5	3.35	3.35	3.35
6	0.00	0.00	0.00
7	0.00	0.00	0.00
8	0.00	0.00	0.00
9	0.00	0.00	0.00
10	0.00	0.00	0.00
11	1.84	1.84	1.84
12	1.84	1.84	1.84
13	0.00	0.00	0.00
14	1.84	1.84	1.84
15	0.00	0.00	0.00
16	0.00	0.00	0.00
17	0.00	0.00	0.00
18	0.00	0.00	0.00
19	0.00	0.00	0.00
20	3.35	3.35	3.35
21	3.35	3.35	3.35
22	0.00	0.00	0.00
23	0.60	0.61	0.61
24	0.00	0.00	0.00
25	1.84	1.84	1.83
26	0.00	0.00	0.00
27	0.00	0.00	0.00
28	3.35	3.35	3.35
29	3.35	3.35	3.35
30	3.35	3.35	3.35
31	1.84	1.84	1.84
32	0.00	0.00	0.00
33	0.00	0.00	0.00
34	3.35	3.35	3.35
35	0.00	0.00	0.00
36	0.00	0.00	0.00
37	2.89	2.89	2.89
38	3.35	3.35	3.35
39	0.00	0.00	0.00
40	1.57	1.56	1.56
41	1.84	1.84	1.84
42	0.00	0.00	0.00
43	1.58	1.63	1.64
44	1.29	1.28	1.26
45	1.06	1.05	1.05
46	1.36	1.35	1.30
47	1.78	1.75	1.73
48	3.35	3.35	3.35

MODE / PIN NO.	EE	PB	REC
49	0.00	0.00	0.00
50	1.58	1.55	1.54
51	1.37	1.37	1.35
52	1.61	1.61	1.61
53	1.61	1.61	1.61
54	1.43	1.43	1.43
55	1.84	1.84	1.84
56	0.00	0.00	0.00
57	1.64	1.69	1.78
58	1.67	1.67	0.89
59	1.67	1.67	1.08
60	1.67	1.68	0.58
61	3.34	3.34	3.34
62	0.00	0.00	0.00
63	1.67	1.67	0.93
64	1.67	1.68	1.12
65	1.67	1.68	1.04
66	1.68	1.68	0.95
67	1.84	1.84	1.84
68	0.00	0.00	0.00
69	0.00	0.00	0.00
70	1.66	1.67	0.95
71	1.67	1.67	0.72
72	1.65	1.67	0.68
73	3.31	3.31	3.31
74	0.87	0.86	0.86
75	0.70	0.70	0.70
76	1.84	1.84	1.83
77	0.00	0.00	0.00
78	1.84	1.84	1.83
79	0.00	0.00	0.00
80	0.00	0.00	0.00
IC508			
1	0.00	0.00	0.00
2	3.18	3.21	3.22
3	4.77	4.81	4.82
4	0.00	0.00	0.00
5	0.00	0.00	0.00
6	0.00	0.00	0.00
7	0.00	0.00	0.00
8	5.02	5.02	5.02
9	3.35	3.35	3.35
10	0.00	0.00	0.00
11	0.00	0.00	0.00
12	0.00	0.00	0.00
13	0.00	0.00	0.00
14	5.02	5.02	5.02
IC602			
1	0.00	0.00	0.00
2	3.35	3.35	3.35
3	3.35	3.35	3.35
4	0.00	0.00	0.00
5	3.35	3.35	3.35
6	3.35	3.35	3.35
7	0.00	0.00	0.00

MODE / PIN NO.	EE	PB	REC
8	3.35	3.35	3.35
9	1.62	1.62	1.62
10	0.00	0.00	0.00
11	0.00	0.00	0.00
12	3.27	3.27	3.27
13	3.27	3.27	3.27
14	3.27	3.27	3.27
15	3.27	3.27	3.27
16	3.27	3.27	3.27
17	3.27	3.27	3.27
18	3.27	3.27	3.27
19	3.35	3.35	3.35
20	3.35	3.35	3.35
IC603			
1	3.35	3.35	3.35
2	0.00	0.00	0.00
3	0.00	0.00	0.00
4	0.00	0.00	0.00
5	0.00	0.00	0.00
6	0.00	0.00	0.00
7	0.00	0.00	0.00
8	0.00	0.00	0.00
9	0.00	0.00	0.00
10	0.00	0.00	0.00
11	3.27	3.27	3.27
12	3.27	3.27	3.27
13	3.27	3.27	3.27
14	3.27	3.27	3.27
15	3.27	3.26	3.26
16	3.26	3.26	3.26
17	3.26	3.26	3.26
18	3.26	3.26	3.26
19	3.35	3.35	3.35
20	3.35	3.35	3.35
IC604			
1	3.35	3.35	3.35
2	0.00	0.00	0.00
3	0.00	0.00	0.00
4	0.00	0.00	0.00
5	0.00	0.00	0.00
6	2.98	2.98	2.98
7	0.00	0.00	0.00
8	2.98	2.98	2.98
9	0.00	0.00	0.00
10	0.00	0.00	0.00
11	3.26	3.26	3.26
12	3.27	3.27	3.27
13	3.27	3.27	3.27
14	3.27	3.27	3.27
15	3.27	3.27	3.27
16	3.27	3.27	3.27
17	3.27	3.27	3.27
18	3.27	3.27	3.27
19	3.35	3.35	3.35
20	3.35	3.35	3.35

MODE / PIN NO.	EE	PB	REC
IC701			
1	0.63	0.87	0.92
2	0.00	0.00	0.00
3	0.00	0.00	0.00
4	4.82	4.82	4.82
5	4.89	4.84	4.88
6	0.00	0.00	0.00
7	0.00	0.00	0.00
8	5.16	5.16	5.16
9	0.00	0.00	0.00
10	0.00	0.00	0.00
11	5.17	5.16	5.16
12	0.00	0.00	0.00
13	5.17	5.16	5.16
14	4.77	4.94	4.82
15	0.00	0.00	0.00
16	0.00	0.00	0.00
17	5.06	5.04	5.17
18	5.04	5.02	5.22
19	5.11	5.11	4.83
20	0.00	0.00	0.00
21	0.00	0.00	0.00
22	0.00	0.00	0.00
23	0.00	0.00	0.00
24	0.00	0.00	0.00
25	5.17	5.17	5.17
26	0.00	0.00	0.00
27	0.00	0.00	0.00
28	4.63	4.63	4.63
29	0.00	0.00	0.00
30	0.00	0.00	0.00
31	0.00	0.00	0.00
32	0.00	0.00	0.00
33	0.66	0.72	0.68
34	0.67	0.71	0.66
35	0.00	0.00	0.00
36	5.17	5.17	5.17
37	2.56	2.52	2.55
38	2.35	2.55	2.43
39	0.00	0.00	0.00
40	2.03	2.04	2.01
41	2.54	2.52	2.52
42	0.00	0.00	0.00
43	3.58	3.42	3.58
44	4.90	4.90	4.90
45	1.00	1.00	0.00
46	0.62	0.60	0.60
47	0.00	0.00	0.00
48	0.00	0.00	0.00
49	1.07	1.07	1.07
50	2.87	2.87	2.75
51	5.23	5.23	5.23
52	3.05	3.05	3.05
53	2.58	2.58	2.58
54	5.23	5.23	5.23

MODE / PIN NO.	EE	PB	REC
55	5.23	5.23	5.23
56	0.00	0.00	0.00
57	5.01	5.01	5.01
58	5.01	5.01	5.01
59	0.64-5.01	0.64-5.02	5.27
60	0.00	0.00	0.00
61	4.95	4.95	4.95
62	0.00	0.00	0.00
63	0.80	0.74	0.74
64	4.86	4.86	4.86
65	0.00	0.00	0.00
66	0.00	0.00	0.00
67	0.00	0.00	0.00
68	0.00	0.00	0.00
69	0.00	0.00	0.00
70	0.00	0.00	0.00
71	0.00	0.00	0.00
72	0.00	0.00	0.00
73	5.28	5.28	5.28
74	0.00	0.00	0.00
75	0.00	0.00	0.00
76	0.00	0.00	0.00
77	0.00	0.00	0.00
78	0.00	0.00	0.00
79	0.00	0.00	0.00
80	0.00	0.00	0.00
81	0.00	0.00	0.00
82	0.00	0.00	0.00
83	0.00	0.00	0.00
84	2.05	2.05	2.05
85	0.00	0.00	0.00
86	0.00	0.00	0.00
87	0.00	0.00	0.00
88	5.28	5.28	5.28
89	5.28	5.28	5.28
90	0.00	0.00	0.00
91	0.00	0.00	0.00
92	0.00	0.00	0.00
93	0.00	0.00	0.00
94	0.00	0.00	0.00
95	0.00	0.00	0.00
96	5.10	5.10	5.10
97	0.00	0.00	0.00
98	0.00	0.00	0.00
99	0.00	0.00	0.00
100	5.17	5.17	5.17
IC807			
1	5.18	5.18	5.18
2	0.08	0.05	0.05
3	0.08	0.05	0.05
4	2.25	2.26	2.26
5	5.01	5.01	5.01
6	1.74	1.70	1.75
7	5.13	5.13	5.13
8	1.72	1.72	1.74

MODE / PIN NO.	EE	PB	REC
9	2.26	2.26	2.26
10	0.00	0.00	0.00
11	1.72	1.71	1.74
12	0.00	0.00	0.00
13	2.26	2.26	2.27
14	5.02	5.01	5.01
15	2.26	2.25	2.26
16	5.18	5.18	5.18
17	2.33	2.24	2.33
18	2.35	2.35	2.35
19	0.00	0.00	0.00
20	2.35	2.34	2.35
21	2.37	2.37	2.37
22	0.00	0.00	0.00
23	1.74	1.71	1.76
24	2.09	2.05	2.10
25	0.00	0.00	0.00
26	1.77	1.74	1.78
27	2.13	2.09	2.14
28	0.00	0.00	0.00
29	1.79	1.76	1.80
30	2.15	2.11	2.17
31	0.06	0.06	0.06
32	2.38	2.38	2.38
IC808			
1	2.79	2.80	2.80
2	12.03	12.03	12.03
3	2.79	2.80	2.80
4	12.03	12.04	12.04
5	3.23	3.04	3.23
6	5.65	5.67	5.66
7	5.71	5.71	5.71
8	5.64	5.64	5.64
9	0.00	0.00	0.00
10	5.63	5.63	5.63
11	11.41	11.41	11.41
12	5.67	5.65	5.65
13	0.00	0.00	0.00
14	5.64	5.64	5.64
15	0.00	0.00	0.00
16	5.64	5.64	5.64
17	0.00	0.00	0.00
18	0.00	0.00	0.00
19	0.00	0.00	0.00
20	5.63	5.63	5.42
21	5.72	5.73	5.69
22	5.72	5.73	5.71
23	5.66	5.65	5.65
24	5.64	5.64	5.63
25	5.73	5.73	5.71
26	5.74	5.72	5.72
27	5.65	5.64	5.64
28	3.28	3.29	3.28
29	2.37	1.99	2.37
30	2.35	1.98	2.37

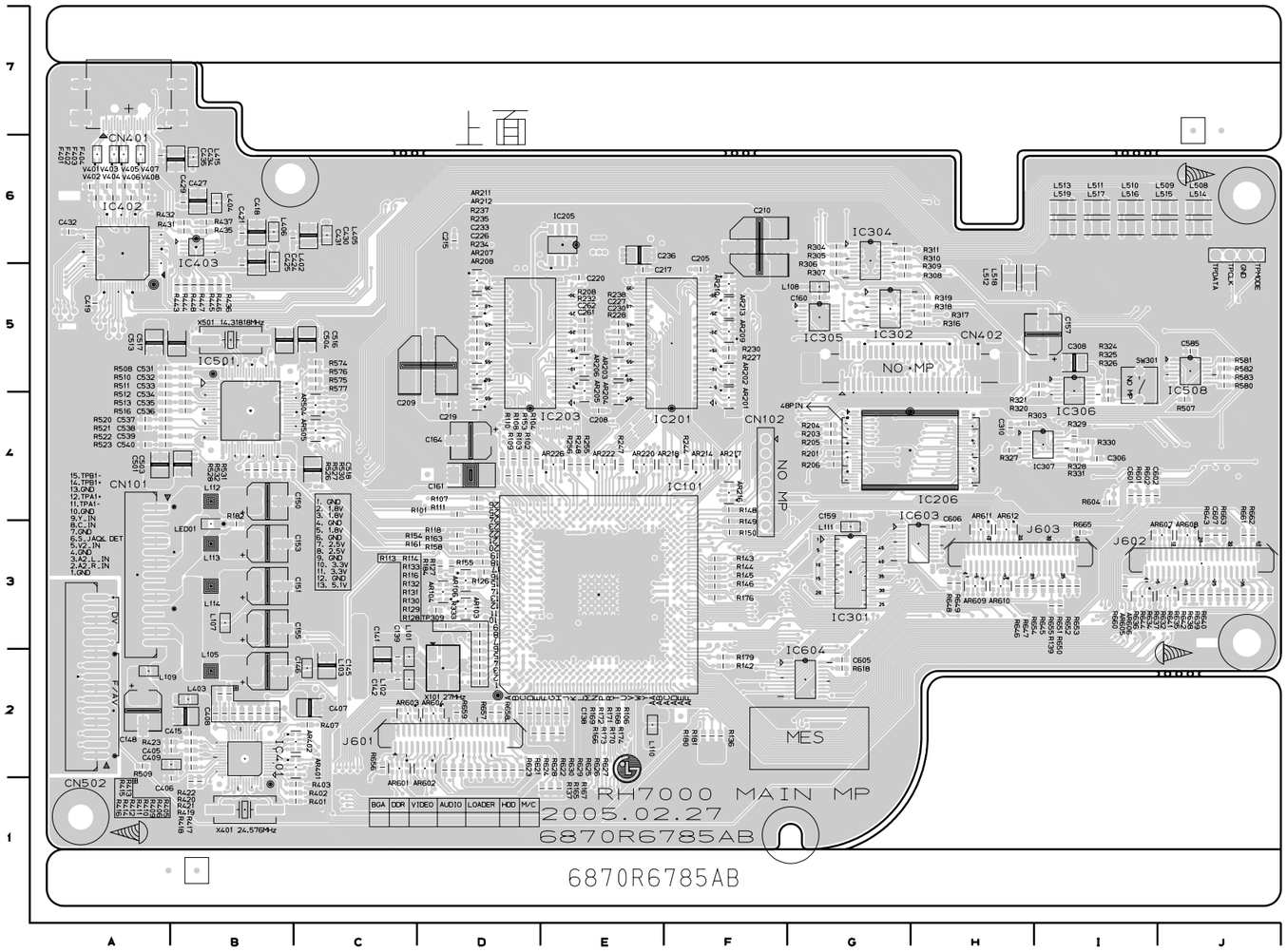
MODE / PIN NO.	EE	PB	REC
31	1.85	1.86	1.86
32	5.05	5.05	5.05
33	5.05	5.05	5.05
34	0.00	0.00	0.00
IC805			
1	1.68	1.68	1.68
2	1.70	1.69	1.69
3	1.68	1.68	1.68
4	1.74	1.75	1.75
5	3.27	3.27	3.27
6	0.00	0.00	0.00
7	3.35	3.35	3.35
8	3.35	3.35	3.35
9	3.36	3.36	3.36
10	3.35	3.35	3.35
11	3.35	3.35	3.35
12	1.34	1.34	1.34
13	4.11	4.11	4.12
14	12.08	12.07	12.07
15	4.19	4.19	4.20
16	0.00	0.00	0.00
17	12.09	12.08	12.08
18	4.20	4.19	4.19
19	12.08	12.07	12.07
20	3.36	3.36	3.36
IC809			
1	7.39	7.39	7.39
2	5.11	5.11	5.11
3	7.23	7.22	7.22
4	0.00	0.00	0.00
5	7.40	7.38	7.39
6	10.97	10.95	10.95
7	6.56	6.54	6.54
8	0.00	0.00	0.00
IC810			
1	7.40	7.39	7.39
2	5.11	5.11	5.11
3	7.27	7.25	7.26
4	0.00	0.00	0.00
5	7.41	7.39	7.40
6	10.96	10.94	10.95
7	6.62	6.59	6.60
8	0.00	0.00	0.00
IC811			
1	6.02	6.02	6.02
2	6.02	6.02	6.02
3	6.02	6.02	6.02
4	0.00	0.00	0.00
5	6.02	6.02	6.02
6	6.02	6.02	6.02
7	6.02	6.02	6.02
8	11.94	11.94	11.94
IC802			
1	3.36	3.36	3.36
2	1.74	1.75	1.75

MODE / PIN NO.	EE	PB	REC
3	3.36	3.36	3.36
4	1.26	1.26	1.26
5	0.00	0.00	0.00
6	5.12	5.12	5.12
7	1.69	1.69	1.69
8	1.68	1.68	1.68
9	3.36	3.35	3.35
10	2.57	2.57	2.57
11	2.59	2.59	2.59
12	2.57	2.57	2.57
13	5.19	5.19	5.19
14	0.00	0.00	0.00
15	5.12	5.14	5.14
16	3.36	3.36	3.36
IC812			
1	5.19	5.19	5.19
2	1.53	1.53	1.53
3	1.52	1.52	1.52
4	0.00	0.00	0.00
5	2.50	2.50	2.50
6	2.34	2.34	2.34
7	0.00	0.00	0.64
8	0.00	0.00	0.64
9	0.00	0.00	0.64
10	0.00	0.00	0.00
11	5.16	5.16	5.16
12	5.08	5.06	5.06
13	5.08	5.08	5.08
14	0.00	0.00	0.47
15	0.00	0.00	0.47
16	0.00	0.00	0.47
17	0.00	0.00	0.47
18	0.00	0.00	0.47
19	5.20	5.20	5.20
20	0.00	0.00	0.00
21	0.00	0.00	0.47
22	5.16	5.16	5.16
23	0.00	0.00	0.00
24	0.00	0.00	0.00
25	0.00	0.00	0.00
26	0.00	0.00	0.00
27	0.00	0.00	0.00
28	0.00	0.00	0.00
29	0.00	0.00	0.00
30	2.85	2.84	2.84
31	2.85	2.84	2.84
32	0.00	0.00	0.00
33	5.20	5.19	5.19
34	4.25	4.24	4.24
35	0.00	0.00	0.00
36	2.86	2.85	2.85
37	0.00	0.00	0.00
38	0.00	0.00	0.00
39	0.00	0.00	0.00
40	2.84	2.84	2.84

MODE / PIN NO.	EE	PB	REC
41	2.85	2.84	2.84
42	2.62	2.62	2.62
43	2.85	2.84	2.84
44	0.00	0.00	0.00
IC806			
1	0.00	0.00	0.00
2	0.00	0.00	0.00
3	0.00	0.00	0.00
4	5.09	5.10	5.09
5	5.09	5.02	5.04
6	0.00	0.00	0.00
7	0.42	0.43	0.43
8	0.00	0.00	0.00
9	0.64-5.01	0.64-5.01	0.64-5.02
10	2.58	2.52	2.60
11	0.00	0.00	0.00
12	2.55	2.54	2.54
13	0.00	0.00	0.00
14	2.51	2.51	2.51
15	2.55	2.54	2.54
16	1.57	1.57	1.57
17	1.51	1.52	1.52
18	0.00	0.00	0.00
19	5.28	5.28	5.28
20	5.27	5.27	5.27
IC703			
1	2.19	2.18	2.18
2	2.30	2.30	2.30
3	5.24	5.24	5.24
4	1.85	1.85	1.85
5	0.00	0.00	0.00
6	5.24	5.24	5.24
IC704			
1	5.24	5.24	5.24
2	0.00	0.00	0.00
3	4.83	4.83	4.83
IC705			
1	0.00	0.00	0.00
2	0.00	0.00	0.00
3	0.00	0.00	0.00
4	0.00	0.00	0.00
5	5.02	5.02	5.02
6	5.04	5.10	5.10
7	0.00	0.00	0.00
8	5.28	5.28	5.28
IC801			
1	2.18	2.18	2.18
2	2.30	2.30	2.30
3	5.21	5.21	5.21
4	1.84	1.84	1.84
5	0.00	0.00	0.00
6	5.21	5.21	5.21

PRINTED CIRCUIT DIAGRAMS

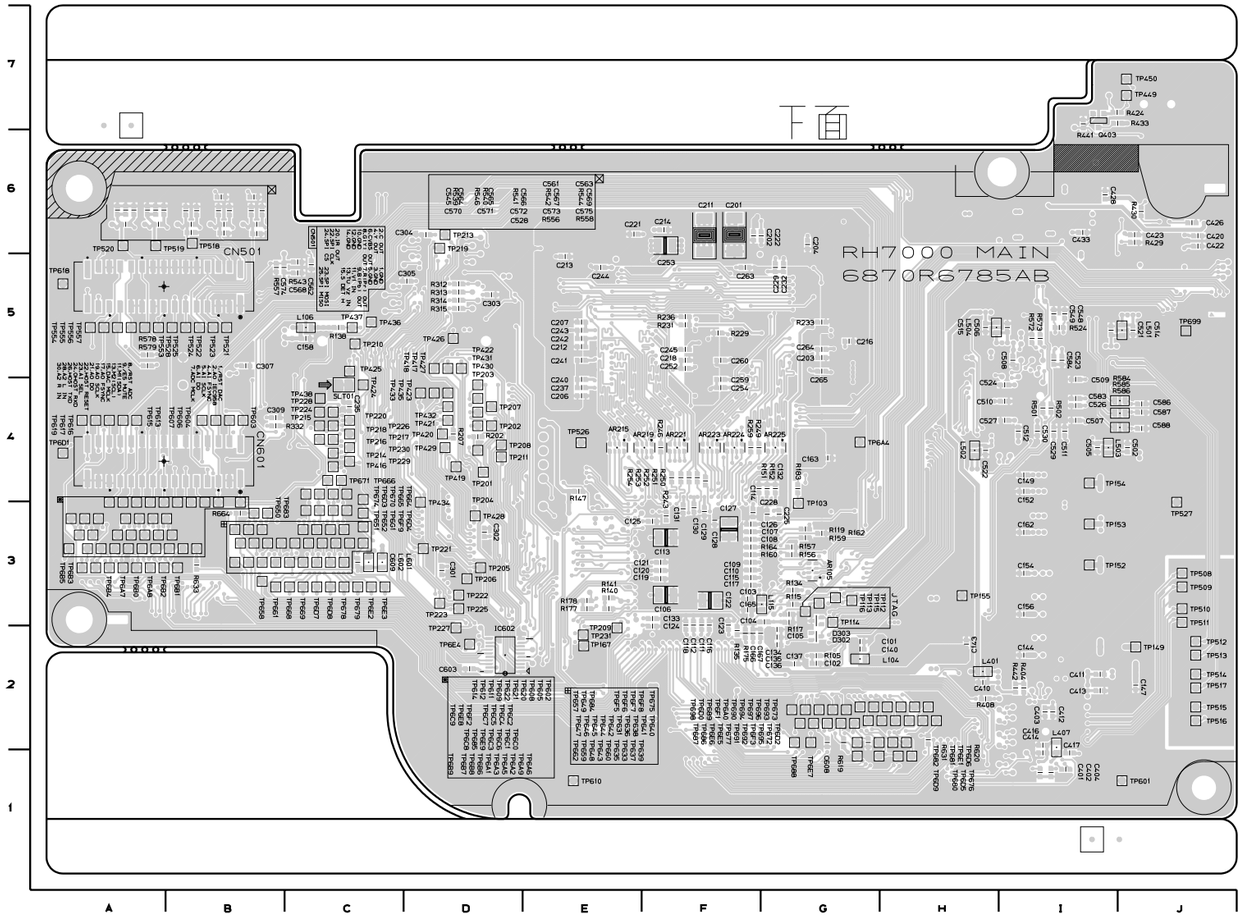
1. MAIN P.C.BOARD(TOP SIDE)



LOCATION GUIDE

AR103	D3	C159	G4	C535	B4	L111	G3	R145	F3	R308	G5	R507	J4	R644	J3	TP331	I5
AR104	D3	C160	G5	C536	B4	L112	B4	R146	F3	R309	G5	R508	A5	R645	I3	TP411	B2
AR106	D3	C161	D4	C537	A4	L113	B3	R148	F4	R310	G6	R509	A2	R646	H3	TP415	B2
AR201	F4	C164	D4	C538	A4	L114	B3	R149	F3	R311	G6	R510	A5	R647	H3	TP451	A5
AR202	F5	C205	F5	C539	B4	L402	B6	R150	F3	R316	H5	R511	A5	R648	H3	TP452	A5
AR203	E5	C208	E4	C540	A4	L403	B2	R153	D4	R317	H5	R512	A4	R649	H3	TP453	A5
AR204	E4	C209	D5	C585	J5	L404	B6	R154	D3	R318	H5	R513	A4	R650	I3	TP454	A5
AR205	E5	C210	F6	C601	I4	L405	C6	R155	D3	R319	H5	R516	A4	R651	I3	TP455	A5
AR206	E5	C215	D6	C602	I4	L406	B6	R158	D3	R320	I4	R520	A4	R652	I3	TP456	A5
AR207	D5	C217	E5	C605	G2	L415	B6	R161	D3	R321	I5	R521	A4	R653	I3	TP457	A5
AR208	D4	C219	D4	C606	H3	L508	J6	R163	D3	R324	I5	R522	A4	R654	I3	TP458	A5
AR209	F5	C220	E5	C607	J3	L509	J6	R165	E1	R325	I5	R523	A4	R655	I3	TP459	A5
AR210	F5	C226	D5	CN101	A3	L510	I6	R166	D2	R326	I4	R526	B4	R656	C2	TP460	A5
AR211	D5	C227	E5	CN102	F4	L511	I6	R167	E1	R327	H4	R527	B4	R657	D2	TP465	A5
AR212	D5	C230	E5	CN401	A7	L512	H5	R168	E2	R328	I4	R528	B4	R658	D2	TP466	A5
AR213	F5	C233	D5	CN402	G5	L513	I6	R169	D2	R329	I4	R530	B4	R659	D2	TP467	A5
AR214	F4	C236	E6	CN502	A2	L514	J6	R170	E2	R330	I4	R531	B4	R660	I3	TP469	B5
AR216	F4	C261	E5	F401	A6	L515	J6	R171	E2	R331	I4	R532	B4	R661	J3	TP476	B2
AR217	F4	C262	E5	F402	A6	L516	I6	R172	D2	R333	D3	R574	C5	R662	J3	TP477	B2
AR218	F4	C306	I4	F403	A6	L517	I6	R173	E2	R401	C1	R575	C5	R663	J3	TP537	B5
AR220	E4	C308	I5	F404	A6	L518	H5	R174	E2	R402	C1	R576	C5	R665	I3	TP543	C4
AR222	E4	C310	H4	GND	J6	L519	I6	R176	F3	R403	C1	R577	C5	SW301	I5	TP544	C4
AR226	E4	C405	B2	IC101	E3	LED01	B3	R179	F2	R405	B2	R580	J5	T342	H5	TP545	C4
AR401	C2	C406	B1	IC201	F5	R101	D4	R180	F2	R406	B2	R581	J5	T344	G5	TP546	C4
AR402	C2	C407	C2	IC203	D5	R102	D4	R181	F2	R407	C2	R582	J5	TP126	D3	TP547	C4
AR504	C4	C408	B2	IC205	E6	R103	D4	R182	B3	R409	B2	R583	J5	TP132	F3	TP548	C4
AR505	C4	C409	B2	IC206	G4	R104	D4	R184	D3	R410	B2	R601	I4	TP134	F3	TP549	C4
AR601	C2	C415	B2	IC301	G3	R106	E2	R201	G4	R411	B2	R602	I4	TP137	F3	TP550	C4
AR602	D2	C418	B6	IC302	G5	R107	D4	R203	G4	R412	B2	R604	I4	TP143	F2	TP552	B4
AR603	C2	C419	A5	IC304	G6	R108	D4	R204	G4	R413	B2	R618	G2	TP144	D3	TP625	I4
AR604	D2	C421	B6	IC305	G5	R109	D4	R205	G4	R414	B2	R621	D2	TP145	C3	TPCLK	J6
AR605	I3	C424	B6	IC306	I5	R110	D4	R206	G4	R415	B2	R622	D2	TP146	C2	TPDATA	J6
AR606	J3	C425	B5	IC307	I4	R111	D4	R208	E5	R416	B2	R623	D2	TP148	C2	TPMODE	J6
AR607	J3	C427	B6	IC401	B2	R113	D3	R227	F5	R417	B1	R624	D2	TP150	F2	V401	A6
AR608	J3	C429	B6	IC402	A6	R114	D3	R228	E5	R418	B1	R625	D2	TP151	A2	V402	A6
AR609	H3	C430	C6	IC403	B6	R116	D3	R230	F5	R419	B2	R626	D2	TP156	A4	V403	A6
AR610	H3	C431	B6	IC501	B4	R118	D3	R232	E5	R420	B2	R627	D2	TP158	G5	V404	A6
AR611	H3	C432	A6	IC508	J5	R126	D3	R234	D5	R421	B2	R628	D2	TP159	G4	V405	A6
AR612	H3	C434	B6	IC603	H3	R127	D3	R235	D5	R422	B2	R629	D2	TP160	B3	V406	A6
C138	D2	C435	A6	IC604	G2	R128	D2	R237	D5	R423	B2	R630	D2	TP161	B3	V407	A6
C139	C2	C501	A4	J601	D2	R129	D2	R238	E5	R431	B6	R632	J3	TP162	B4	V408	A6
C141	C2	C503	B4	J602	J3	R130	D2	R244	F4	R432	B6	R634	J3	TP164	F3	X101	D2
C142	C2	C504	B5	J603	H3	R131	D2	R247	E4	R435	B6	R635	J3	TP166	F3	X401	B1
C145	C2	C513	A5	L101	C2	R132	D2	R248	E4	R436	B5	R636	J3	TP304	G5	X501	B5
C146	B2	C516	C5	L102	C2	R133	D3	R255	E4	R437	B6	R637	J3	TP307	G5		
C148	A2	C517	B5	L103	C2	R136	F2	R256	E4	R443	B5	R638	J3	TP308	G5		
C150	B4	C518	C4	L105	B2	R137	E1	R303	H4	R444	B5	R639	J3	TP309	D3		
C151	B3	C531	B5	L107	B3	R139	I3	R304	G6	R445	B5	R640	J3	TP315	H6		
C153	B3	C532	B5	L108	G5	R142	F2	R305	G6	R446	B5	R641	J3	TP320	H5		
C155	B3	C533	B5	L109	A2	R143	F3	R306	G5	R447	B5	R642	J3	TP321	H5		
C157	I5	C534	B4	L110	E2	R144	F3	R307	G5	R448	B5	R643	J3	TP328	G5		

2. MAIN P.C.BOARD(BOTTOM SIDE)

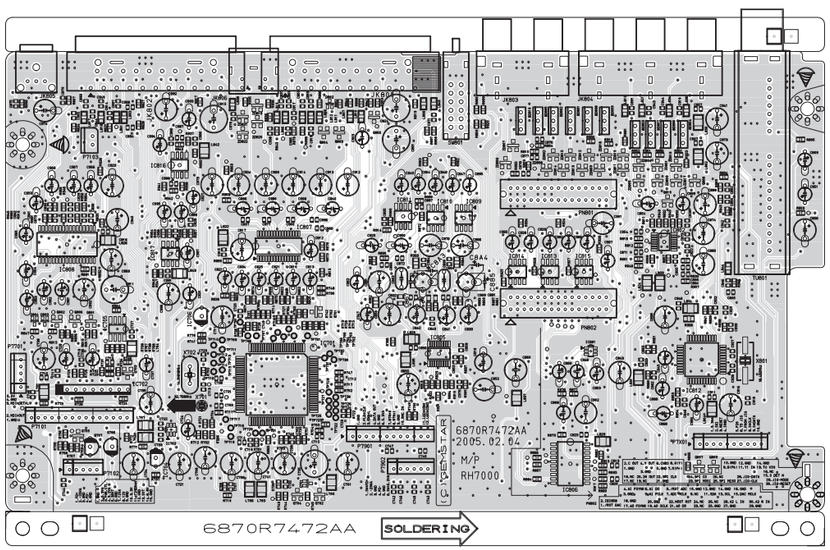


LOCATION GUIDE

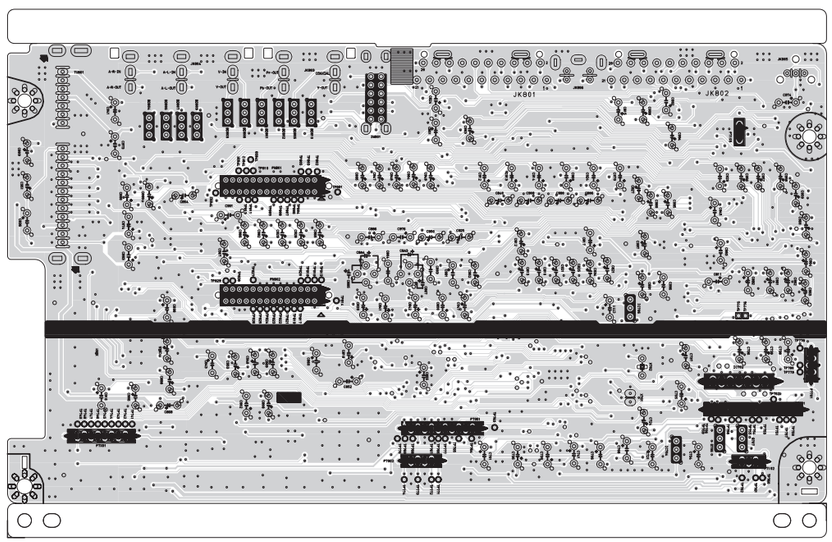
AR105	G3	C162	I3	C413	I2	C603	D2	R252	F4	TP128	E3	TP303	C5	TP461	J5	TP553	A5	TP660	C3	TP6B4	A3
AR215	E4	C163	G4	C414	I1	C608	G2	R253	F4	TP129	E3	TP305	C5	TP462	J5	TP554	A5	TP661	B3	TP6B5	A3
AR219	F4	C165	F3	C416	I2	C609	C3	R254	F4	TP130	E3	TP306	C5	TP463	J5	TP555	A5	TP662	B3	TP6B6	A3
AR221	F4	C166	F2	C417	I1	CN501	A5	R259	F4	TP131	E3	TP311	D5	TP464	J5	TP556	A5	TP663	D2	TP6B7	A3
AR223	F4	C167	F2	C420	J6	CN601	A4	R312	D5	TP133	E3	TP312	D5	TP468	I7	TP557	A5	TP664	C4	TP6B8	A3
AR224	F4	C201	F6	C422	J6	D302	G2	R313	D5	TP135	E4	TP313	D6	TP470	I5	TP601	J1	TP665	C4	TP6B9	A3
AR225	G4	C202	F6	C423	J6	D303	G3	R314	D5	TP136	E3	TP316	D5	TP471	I5	TP602	B3	TP666	C4	TP6C0	B3
C101	G2	C203	G5	C426	J6	IC602	D2	R315	D5	TP138	E3	TP317	D5	TP472	I1	TP603	B4	TP668	C3	TP6C1	A3
C102	G2	C204	G6	C428	I6	L104	G2	R332	B4	TP139	E3	TP318	D5	TP473	I1	TP604	B4	TP669	C3	TP6C2	B3
C103	F3	C206	E4	C433	I6	L106	C5	R404	I2	TP140	E3	TP319	D5	TP474	I1	TP605	B3	TP670	C4	TP6C3	A3
C104	G3	C207	E5	C502	J4	L115	G3	R408	H2	TP141	E3	TP325	D5	TP475	I1	TP606	B4	TP671	C4	TP6C4	A3
C105	G3	C211	F6	C505	I4	L401	H2	R424	I7	TP142	E3	TP326	D5	TP478	I7	TP607	B4	TP672	H2	TP6C5	A3
C106	F3	C212	E5	C506	I5	L407	I2	R429	J6	TP147	H2	TP327	D6	TP501	A6	TP608	B3	TP673	H2	TP6C6	A3
C107	F3	C213	E5	C507	I4	L501	J5	R430	J6	TP149	J2	TP329	B5	TP502	A6	TP609	A3	TP674	C4	TP6C7	A3
C108	F3	C214	F6	C508	I5	L502	H4	R433	I7	TP152	I3	TP338	C5	TP503	B6	TP610	E1	TP675	C3	TP6C8	A3
C109	F3	C216	G5	C509	I4	L503	I4	R441	I7	TP153	I3	TP401	I2	TP504	B6	TP611	A3	TP676	H1	TP6C9	A3
C110	F3	C218	F5	C510	I4	L504	H5	R442	I2	TP154	I4	TP402	I2	TP505	B5	TP612	A3	TP677	G2	TP6D0	G2
C111	F2	C221	E6	C511	I4	L601	C3	R501	I4	TP155	H3	TP403	I2	TP506	B6	TP613	A4	TP678	C3	TP6D1	A4
C112	F2	C222	G6	C512	I4	L602	C3	R502	I4	TP157	C5	TP404	I2	TP508	J3	TP614	A3	TP679	C3	TP6D2	H2
C113	F3	C225	G3	C514	J5	Q403	I7	R524	I5	TP163	E3	TP405	I2	TP509	J3	TP615	A4	TP680	G1	TP6D3	C4
C114	F3	C228	G3	C515	H5	R105	G2	R539	A6	TP167	E2	TP406	I2	TP510	J3	TP616	A4	TP681	G2	TP6D4	C3
C115	F3	C229	G5	C521	I5	R115	G3	R540	A6	TP201	D4	TP407	I2	TP511	J3	TP617	A4	TP682	G2	TP6D5	H1
C116	F2	C232	G5	C522	H4	R117	G3	R541	B6	TP202	D4	TP408	I2	TP512	J2	TP618	A5	TP683	B3	TP6D6	H2
C117	F3	C235	C4	C523	I5	R119	G3	R542	B6	TP203	D4	TP409	I2	TP513	J2	TP619	A4	TP684	B3	TP6D7	C3
C118	F2	C237	E4	C524	I4	R134	G3	R543	C5	TP204	D4	TP410	I2	TP514	J2	TP620	B3	TP685	A3	TP6D8	C3
C119	F3	C240	E4	C526	I4	R135	F2	R544	B6	TP205	D3	TP412	I2	TP515	J2	TP621	B3	TP686	G2	TP6D9	G1
C120	F3	C241	E5	C527	I4	R138	C5	R546	A6	TP206	D3	TP413	I2	TP516	J2	TP622	A3	TP687	G2	TP6E1	H2
C121	F3	C242	E5	C528	B6	R140	E3	R556	B6	TP207	D4	TP414	I2	TP517	J2	TP630	E2	TP688	G2	TP6E2	C3
C122	F3	C243	E5	C529	I4	R141	E3	R557	B5	TP208	D4	TP416	C4	TP518	B6	TP631	C3	TP689	G2	TP6E3	C3
C123	F2	C244	E5	C530	I4	R147	E4	R558	B6	TP209	E2	TP417	D5	TP519	A6	TP632	E2	TP690	G2	TP6E4	D2
C124	F2	C245	F5	C545	A6	R151	F4	R572	I5	TP210	C5	TP418	D5	TP520	A6	TP633	C3	TP691	G2	TP6E5	G2
C125	F3	C252	F5	C548	I5	R152	G4	R573	I5	TP211	D4	TP419	D4	TP521	B5	TP634	D4	TP692	H2	TP6E6	G2
C126	F3	C253	F6	C549	I5	R156	G3	R578	A5	TP213	D6	TP420	D4	TP522	B5	TP635	C3	TP693	H2	TP6E7	G2
C127	F3	C254	F4	C561	B6	R157	G3	R579	A5	TP214	C4	TP421	D4	TP523	B5	TP636	C3	TP694	G2	TP6E8	A3
C128	F3	C259	F4	C562	C5	R159	G3	R584	J4	TP215	C4	TP422	D4	TP524	B5	TP637	C3	TP695	H2	TP6E9	A3
C129	F3	C260	F5	C563	B6	R160	F3	R585	J4	TP216	C4	TP423	D4	TP525	B5	TP638	C3	TP696	H2	TP6F1	G2
C130	F3	C263	F5	C564	A6	R162	G3	R586	J4	TP217	C4	TP424	C4	TP526	E4	TP639	C3	TP697	H2	TP6F2	A3
C131	F3	C264	G5	C565	A6	R164	F3	R619	G2	TP218	C4	TP425	C5	TP527	J3	TP640	C3	TP698	G2	TP6F3	H2
C132	G4	C265	G5	C566	B6	R175	F2	R620	H2	TP219	D6	TP426	D5	TP528	A5	TP641	C3	TP699	J5	TP6F4	E2
C133	F3	C301	D3	C567	B6	R177	E3	R631	G2	TP220	C4	TP427	D5	TP529	I4	TP642	C3	TP6A0	G2	TP6F5	C3
C134	G2	C302	D3	C568	C5	R178	E3	R633	B3	TP221	D3	TP428	D3	TP530	I4	TP643	B3	TP6A1	A3	TP6F6	C3
C135	G2	C303	D5	C569	B6	R183	G4	R664	B3	TP222	D3	TP429	D4	TP531	I5	TP644	B3	TP6A2	B3	TP6F7	C3
C136	G2	C304	D6	C570	A6	R202	D4	SLT01	C4	TP223	D3	TP430	D4	TP532	I5	TP645	B3	TP6A3	A3	TP6F8	C3
C137	G2	C305	D5	C571	A6	R207	D4	TP103	G3	TP224	C4	TP431	D4	TP533	I5	TP646	B3	TP6A4	G4	TP6F9	C3
C140	G2	C307	B5	C572	B6	R229	F5	TP104	F2	TP225	D3	TP432	D4	TP534	H5	TP647	B3	TP6A5	A3	TP6G1	C3
C143	H2	C309	B4	C573	B6	R231	F5	TP111	G3	TP226	C4	TP433	D4	TP535	I5	TP648	B3	TP6A6	B3		
C144	I2	C401	I1	C574	B5	R233	G5	TP112	G3	TP227	D2	TP434	D3	TP536	I5	TP649	B3	TP6A7	A3		
C147	J2	C402	I1	C575	B6	R236	F5	TP113	G3	TP228	C4	TP435	D4	TP538	I5	TP650	B3	TP6A8	A3		
C149	I4	C403	I2	C583	I4	R243	F3	TP114	G3	TP229	C4	TP436	C5	TP539	I5	TP651	C3	TP6A9	B3		
C152	I4	C404	I1	C584	I5	R246	F4	TP115	G3	TP230	C4	TP437	C5	TP540	I5	TP652	C3	TP6B0	A3		
C154	I3	C410	H2	C586	J4	R249	F4	TP116	G3	TP231	E2	TP438	C4	TP541	H5	TP657	B3	TP6B1	B3		
C156	I3	C411	I2	C587	J4	R250	F4	TP125	G3	TP301	D6	TP449	J7	TP542	H5	TP658	B3	TP6B2	A3		
C158	C5	C412	I2	C588	J4	R251	F4	TP127	G3	TP302	D6	TP450	J7	TP551	I4	TP659	B3	TP6B3	A3		

3. I/O P.C.BOARD

(TOP VIEW)

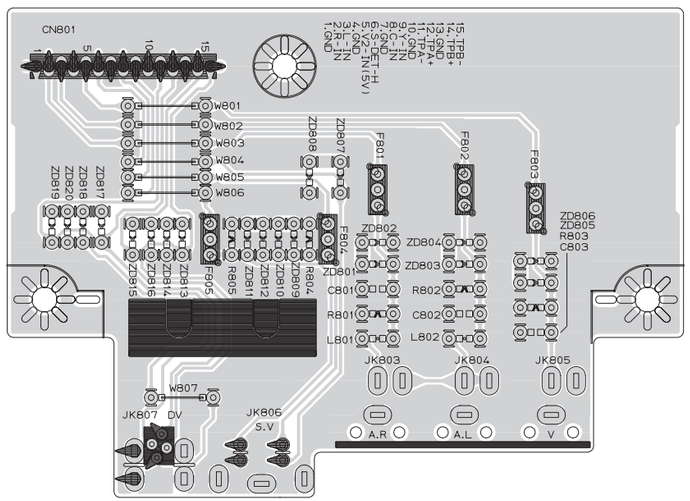


(BOTTOM VIEW)

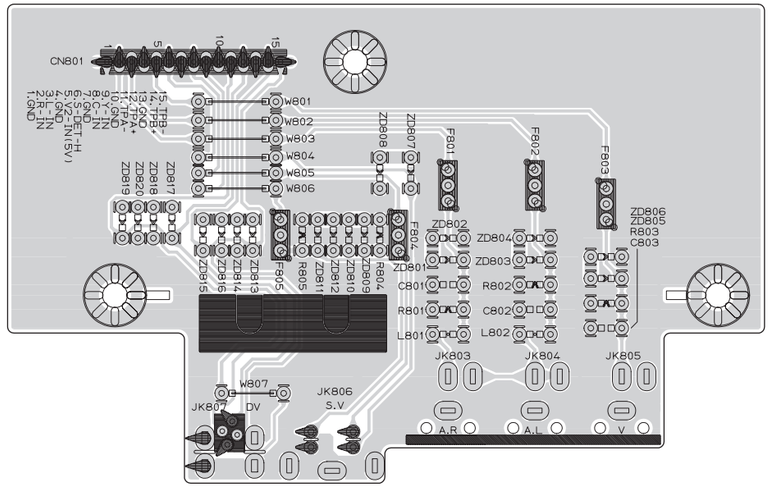


4. JACK P.C.BOARD

(5, 6 TOOL)

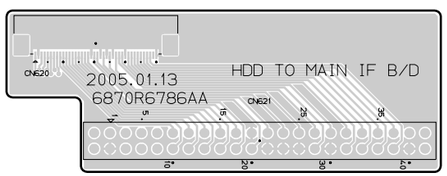


(8, 9 TOOL)

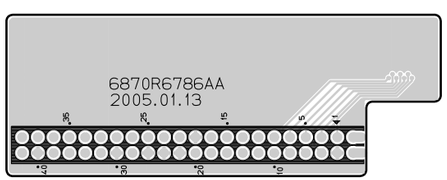


5. HDD P.C.BOARD

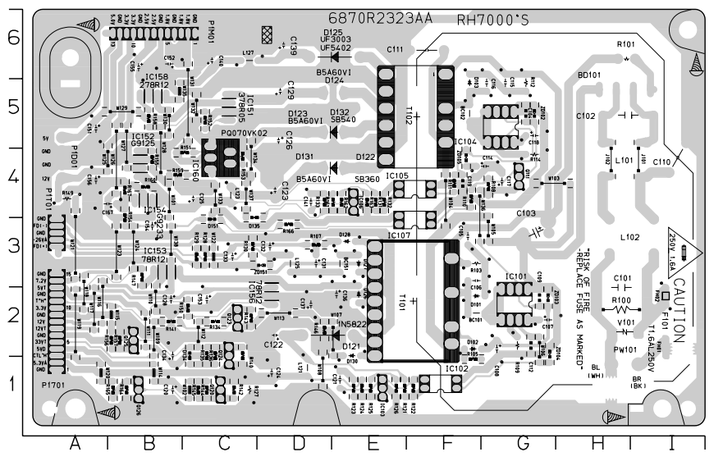
(TOP VIEW)



(BOTTOM VIEW)



6. POWER P.C.BOARD



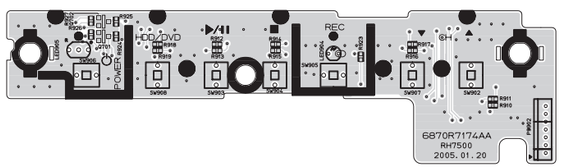
LOCATION GUIDE

BC101	F2	C133	C3	IC101	G2	R100	H5	R146	D2
BC102	F5	C134	B2	IC102	F1	R101	H6	R147	B3
BC151	E3	C136	E2	IC103	E1	R103	F3	R149	A4
BD101	H5	C137	D2	IC104	G5	R105	F1	R150	C2
C101	H2	C139	D6	IC105	E4	R107	D3	R151	C4
C102	H5	C140	C6	IC106	E4	R108	G4	R152	C5
C103	G3	C141	D4	IC107	E3	R109	G2	R153	C4
C104	G5	C151	A5	IC151	C5	R110	F4	R154	B4
C105	F3	C152	B6	IC152	B4	R111	F4	R155	B4
C106	F3	C153	C2	IC153	B3	R112	G5	R156	B2
C107	G2	C154	B3	IC154	B4	R114	G4	R157	B2
C108	G2	C155	B6	IC156	D2	R121	E1	R158	B5
C109	G2	C156	A4	IC158	B5	R122	F1	R159	B4
C110	I4	C167	B4	IC160	C4	R123	E1	R160	B4
C111	F6	D101	F2	J101	I4	R124	E1	R161	E4
C112	G2	D102	F2	J102	H4	R125	E1	R162	E4
C114	G4	D103	F5	L101	H4	R126	E1	R163	E4
C115	G5	D121	D2	L102	I3	R127	C1	R164	B1
C116	G5	D122	E4	L121	D1	R128	C3	R165	B1
C117	G4	D123	E5	L123	C4	R129	C3	R166	D3
C118	G5	D124	E5	L125	D3	R130	C3	R167	B4
C119	F4	D125	E6	L127	C6	R131	E4	T101	F2
C120	B1	D126	E2	P1701	A1	R132	E4	T102	F5
C121	E1	D127	E3	P1D01	A4	R133	G4	V101	H2
C122	D2	D128	E3	P1M01	C6	R134	C2	ZD102	G5
C123	D4	D130	E2	P1T01	A3	R135	C2	ZD103	G2
C124	D1	D131	E4	PW101	H1	R136	C2	ZD104	G2
C125	C4	D132	E5	Q111	G4	R140	C2	ZD105	F4
C126	D5	D134	C2	Q120	C1	R141	B2	ZD151	D3
C128	B2	D135	C3	Q123	C2	R142	C1		
C129	D5	D151	C3	Q124	C2	R143	C2		
C131	D3	FH01	I2	Q125	B2	R144	C1		
C132	D3	FH02	I2	Q126	B1	R145	C1		

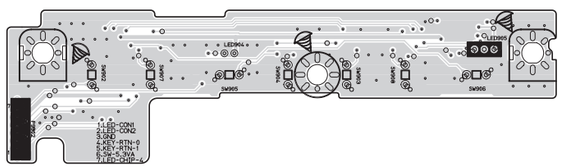
7. KEY P.C.BOARD

(5TOOL ONLY)

(TOP VIEW)

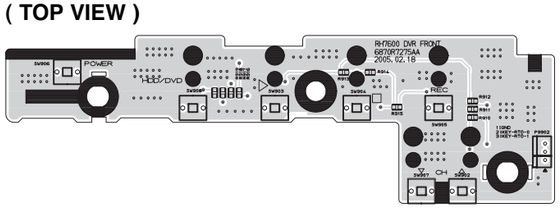


(BOTTOM VIEW)

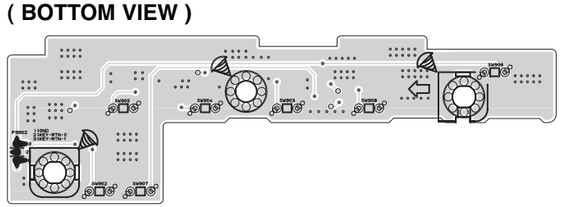


(6TOOL ONLY)

(TOP VIEW)

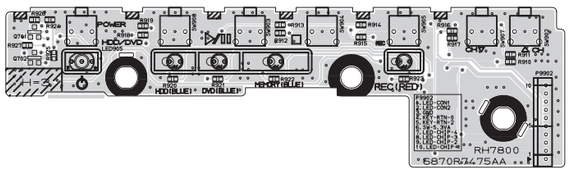


(BOTTOM VIEW)

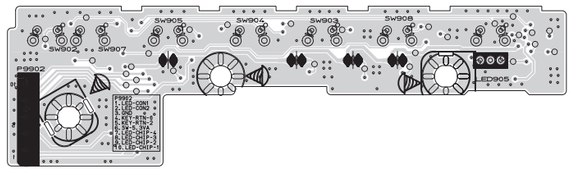


(8TOOL ONLY)

(TOP VIEW)

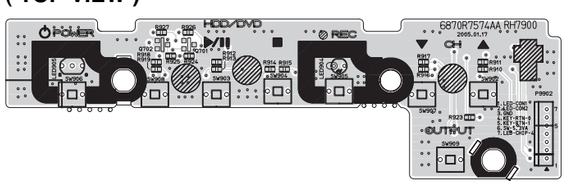


(BOTTOM VIEW)

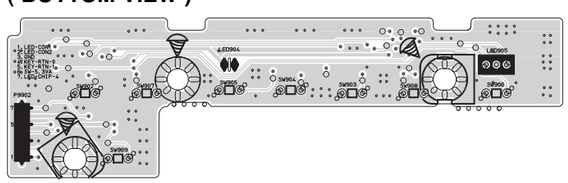


(9TOOL ONLY)

(TOP VIEW)



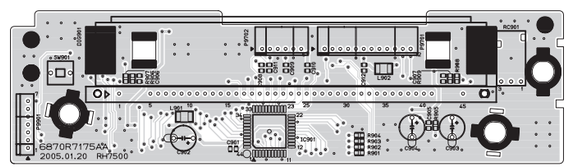
(BOTTOM VIEW)



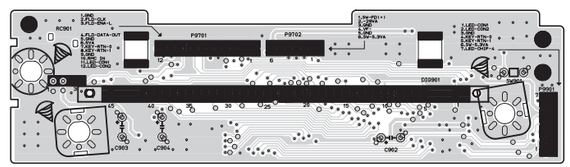
8. TIMER(LED) P.C.BOARD

(5TOOL ONLY)

(TOP VIEW)

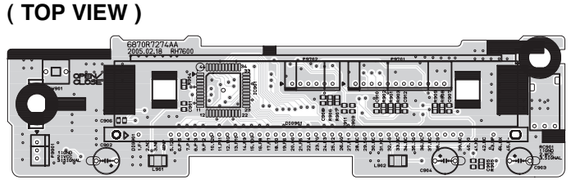


(BOTTOM VIEW)

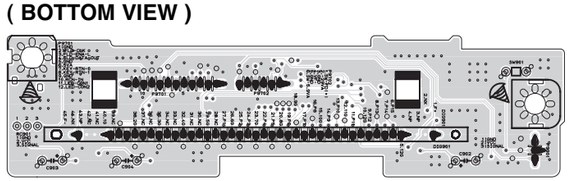


(6TOOL ONLY)

(TOP VIEW)

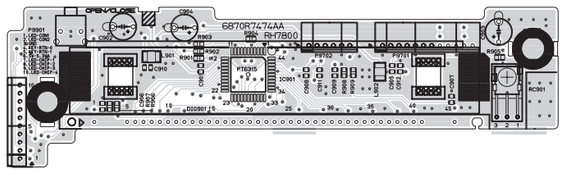


(BOTTOM VIEW)

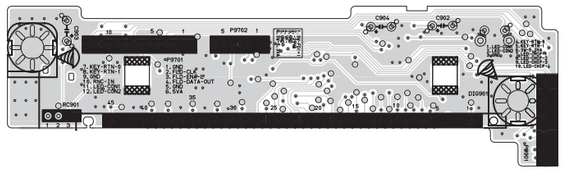


(8TOOL ONLY)

(TOP VIEW)

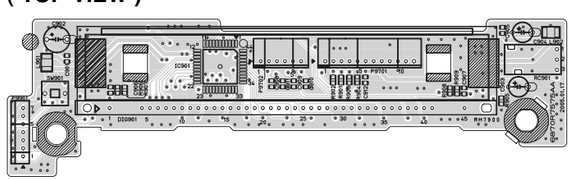


(BOTTOM VIEW)

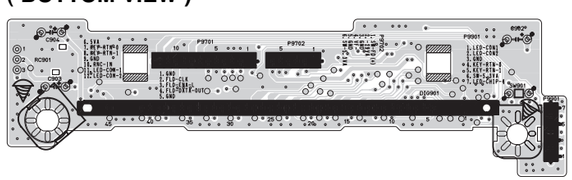


(9TOOL ONLY)

(TOP VIEW)



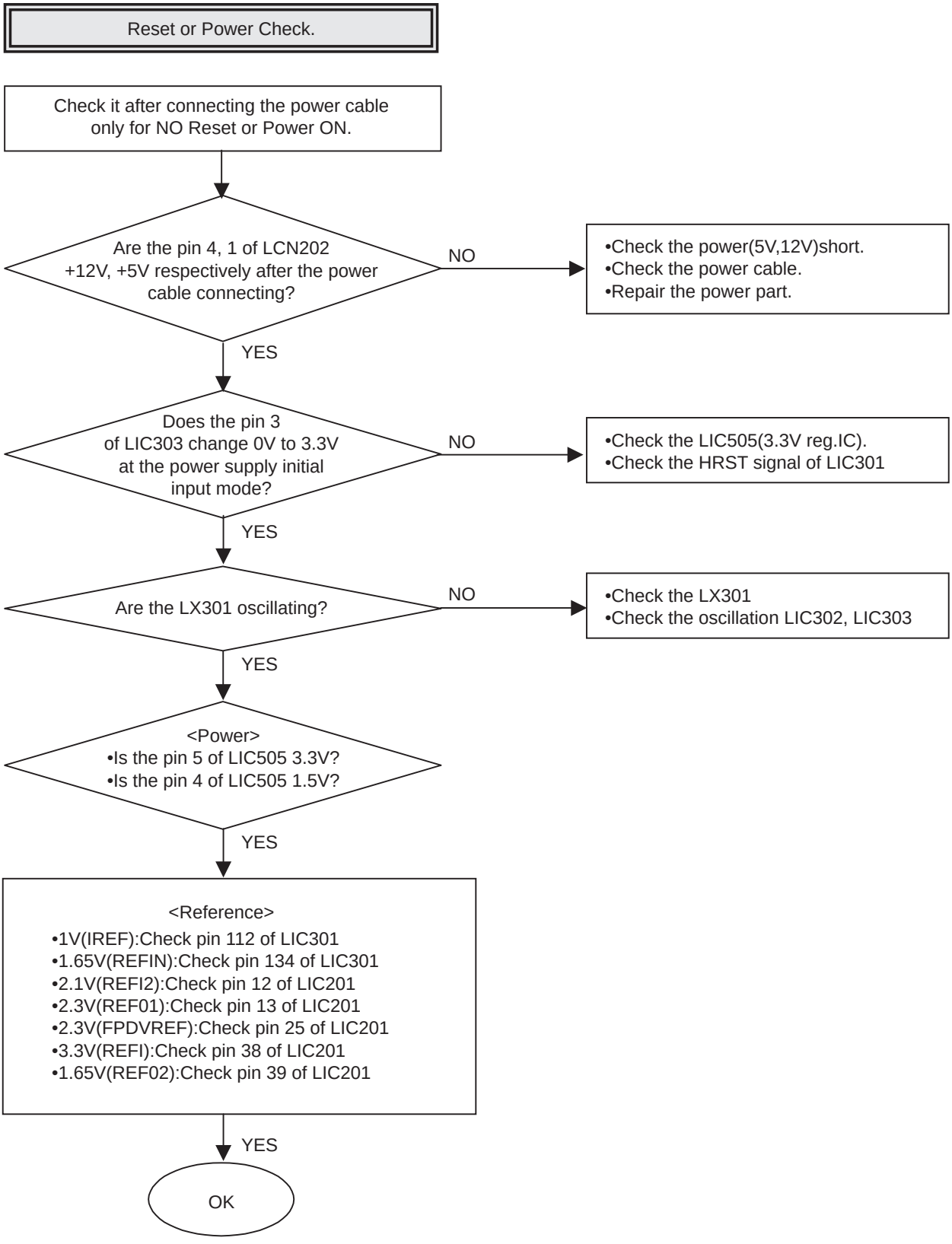
(BOTTOM VIEW)

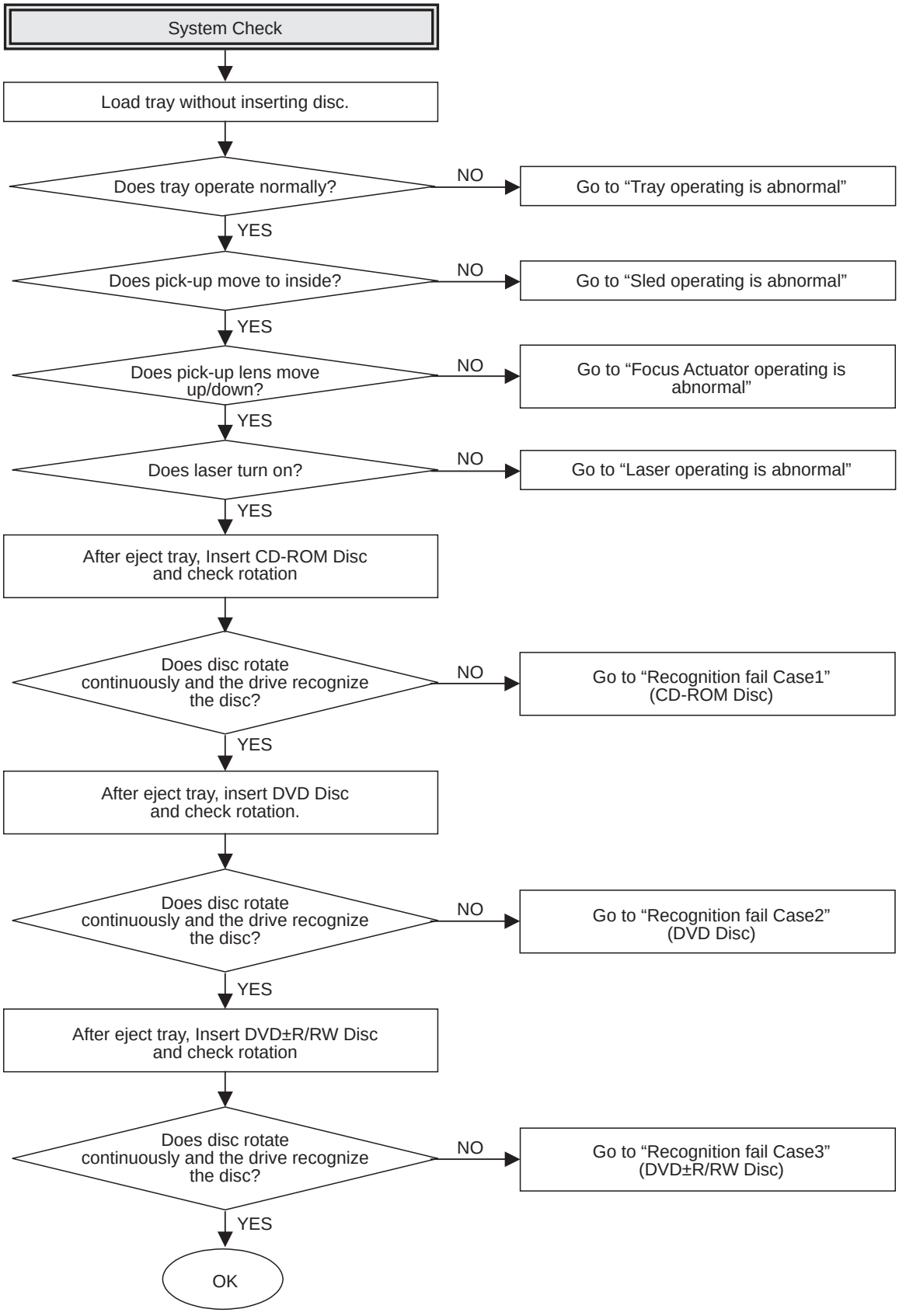


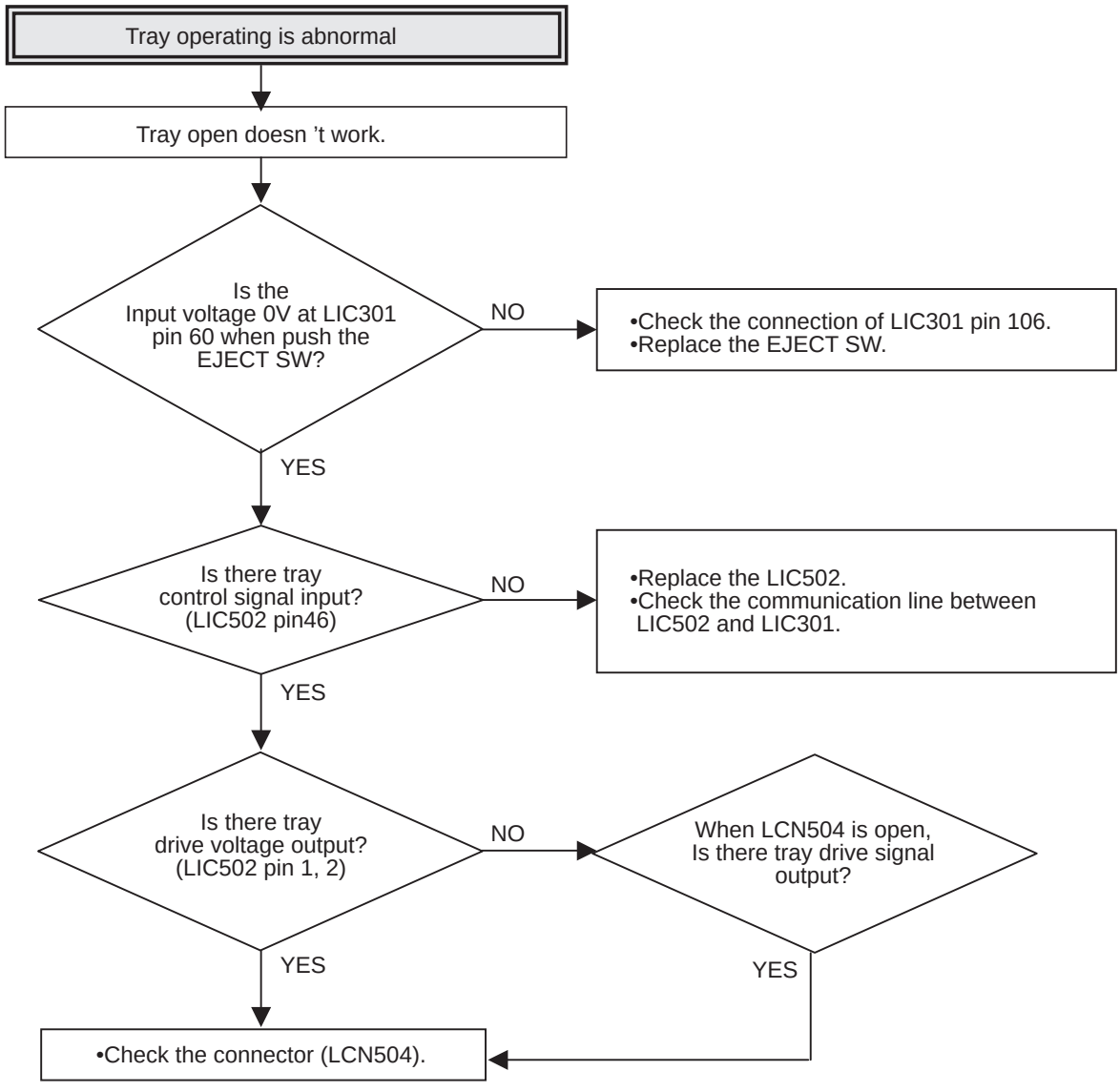
SECTION 4
RL-05 LOADER PART

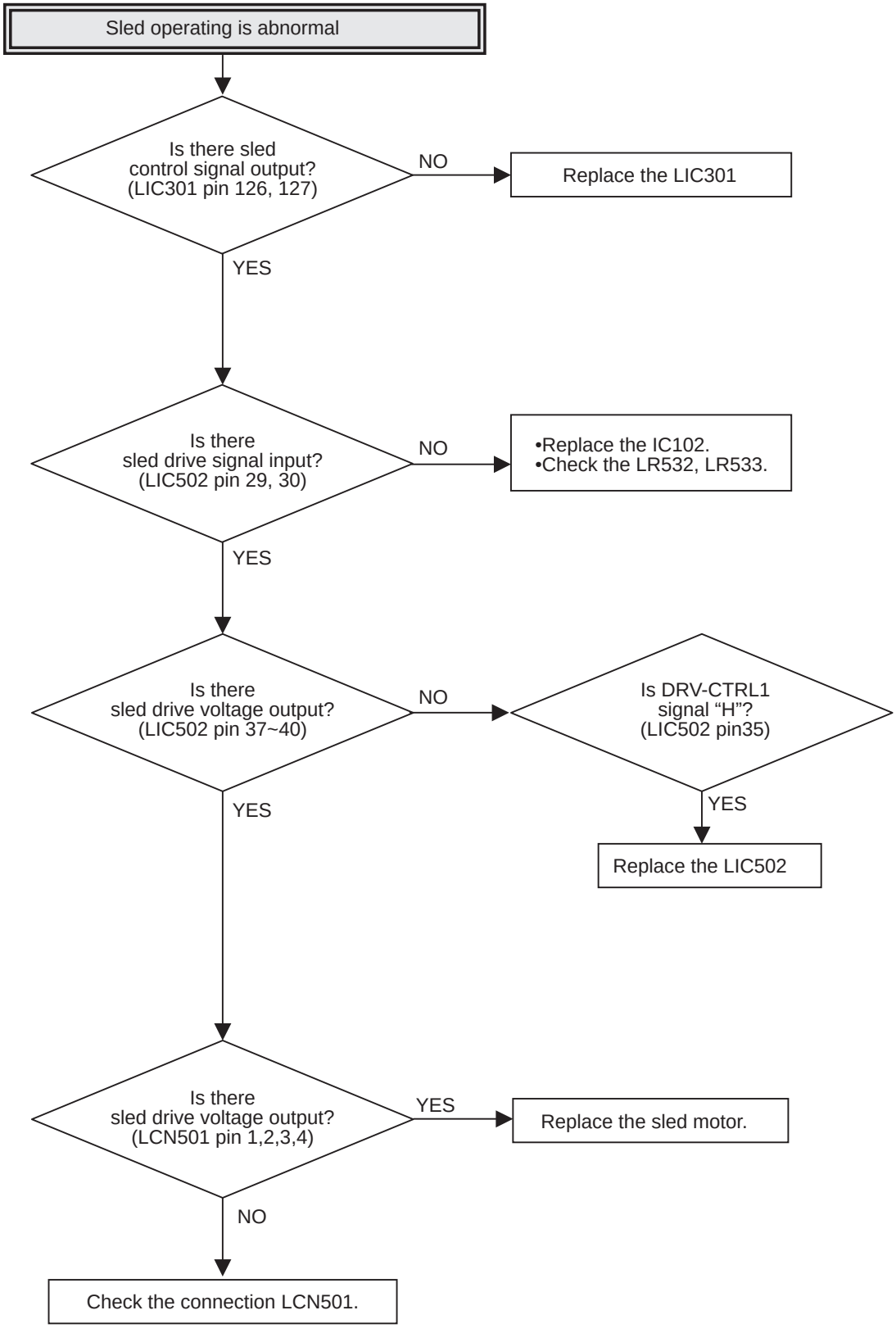
CONTENTS

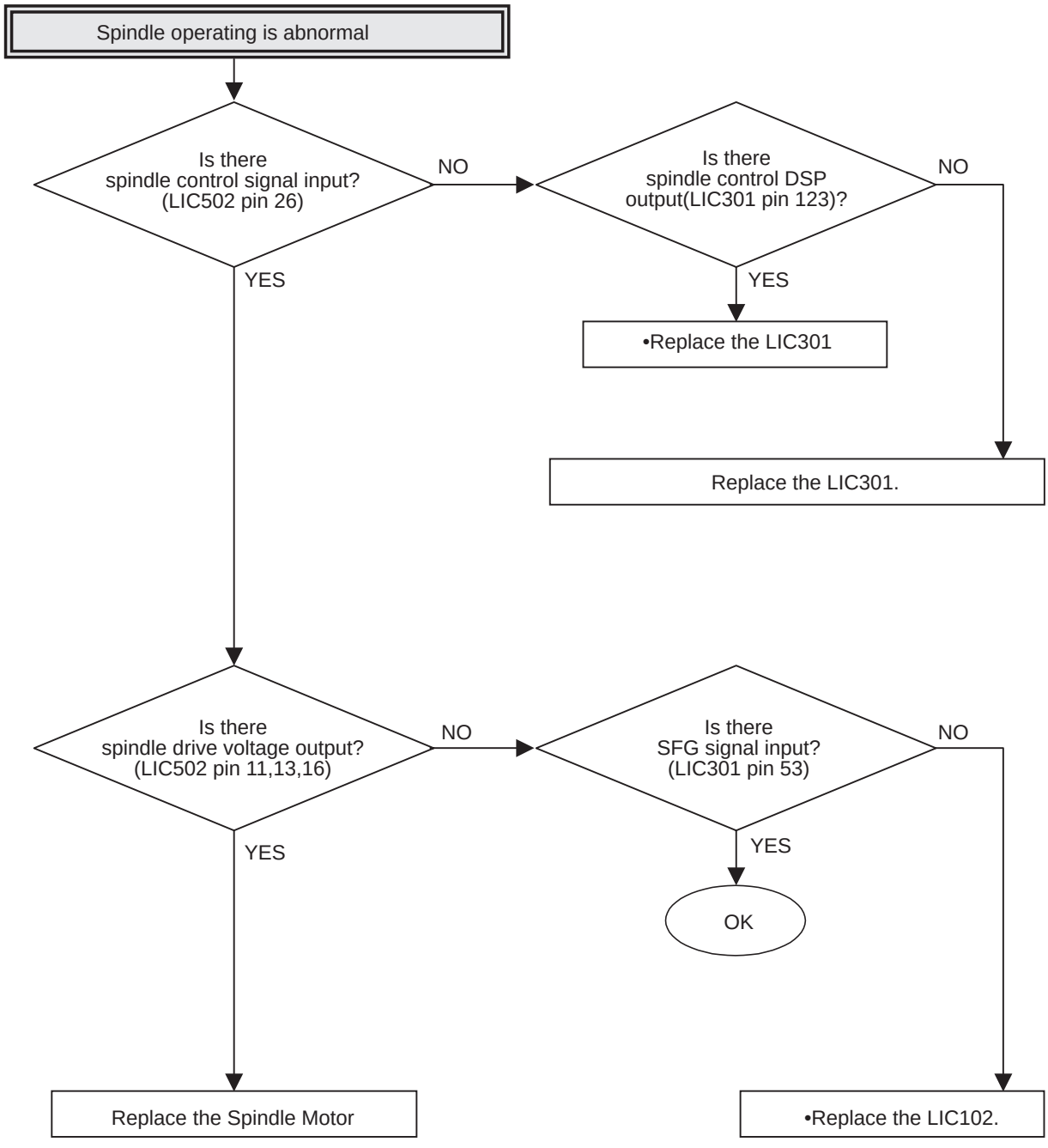
ELECTRICAL TROUBLESHOOTING GUIDE

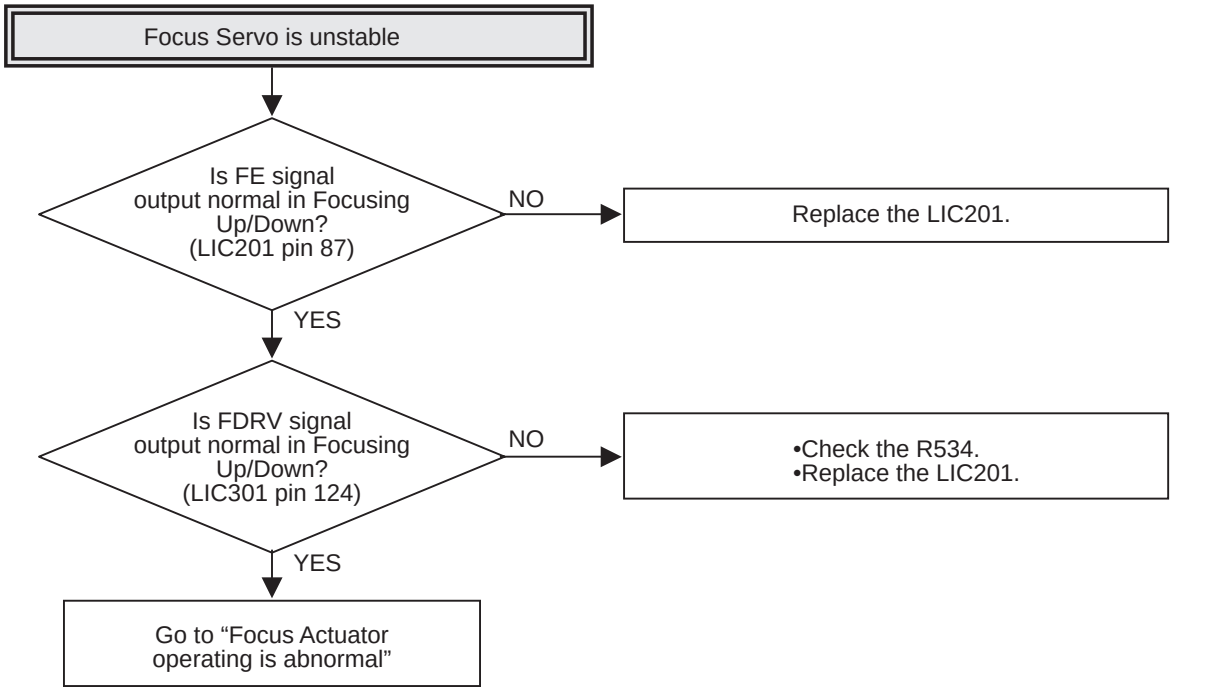


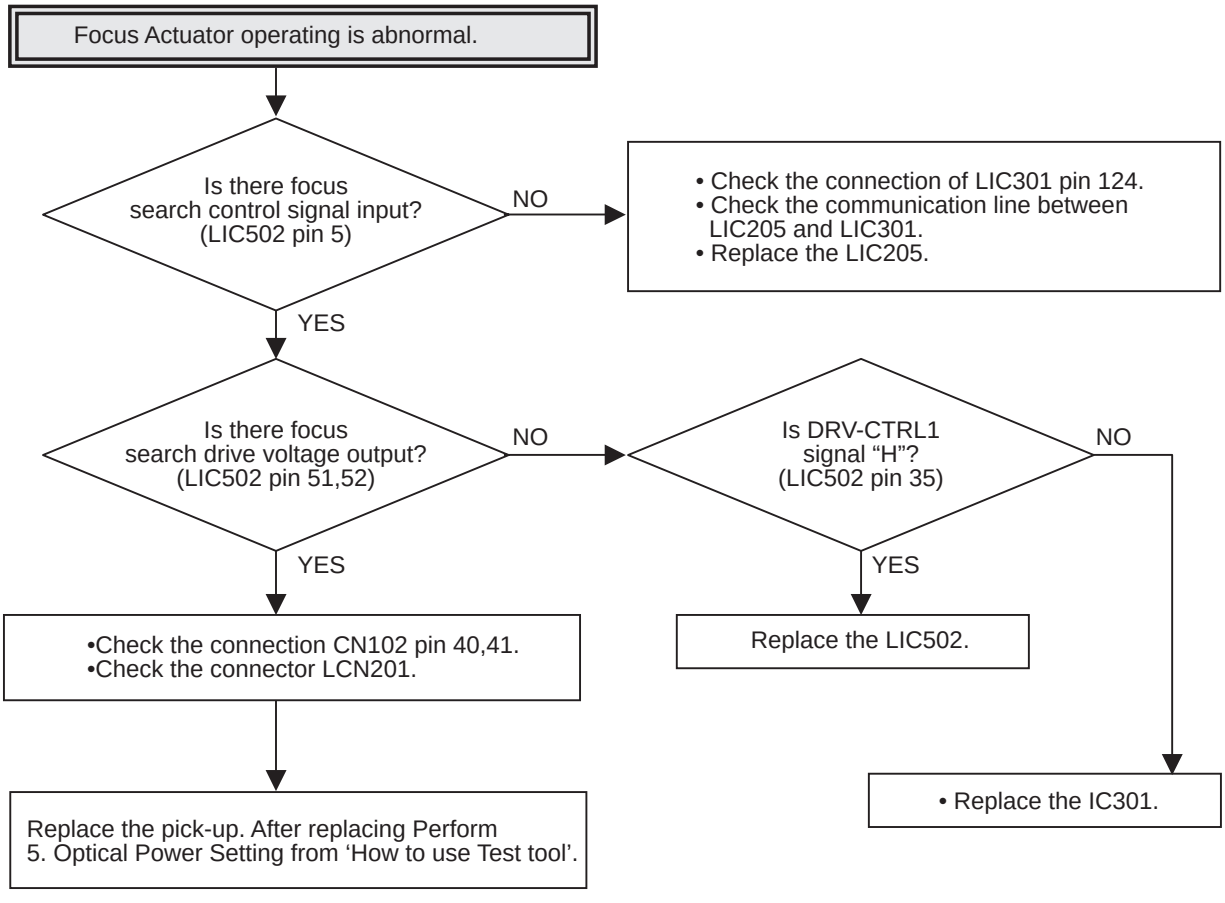

System Check
Load tray without inserting disc.
Does tray operate normally?
NO
Go to “Tray operating is abnormal”
YES
Does pick-up move to inside?
NO
Go to “Sled operating is abnormal”
YES
Does pick-up lens move up/down?
NO
Go to “Focus Actuator operating is abnormal”
YES
Does laser turn on?
NO
Go to “Laser operating is abnormal”
YES
After eject tray, Insert CD-ROM Disc and check rotation
Does disc rotate continuously and the drive recognize the disc?
NO
Go to “Recognition fail Case1” (CD-ROM Disc)
YES
After eject tray, insert DVD Disc and check rotation.
Does disc rotate continuously and the drive recognize the disc?
NO
Go to “Recognition fail Case2” (DVD Disc)
YES
After eject tray, Insert DVD±R/RW Disc and check rotation
Does disc rotate continuously and the drive recognize the disc?
NO
Go to “Recognition fail Case3” (DVD±R/RW Disc)
YES
OK

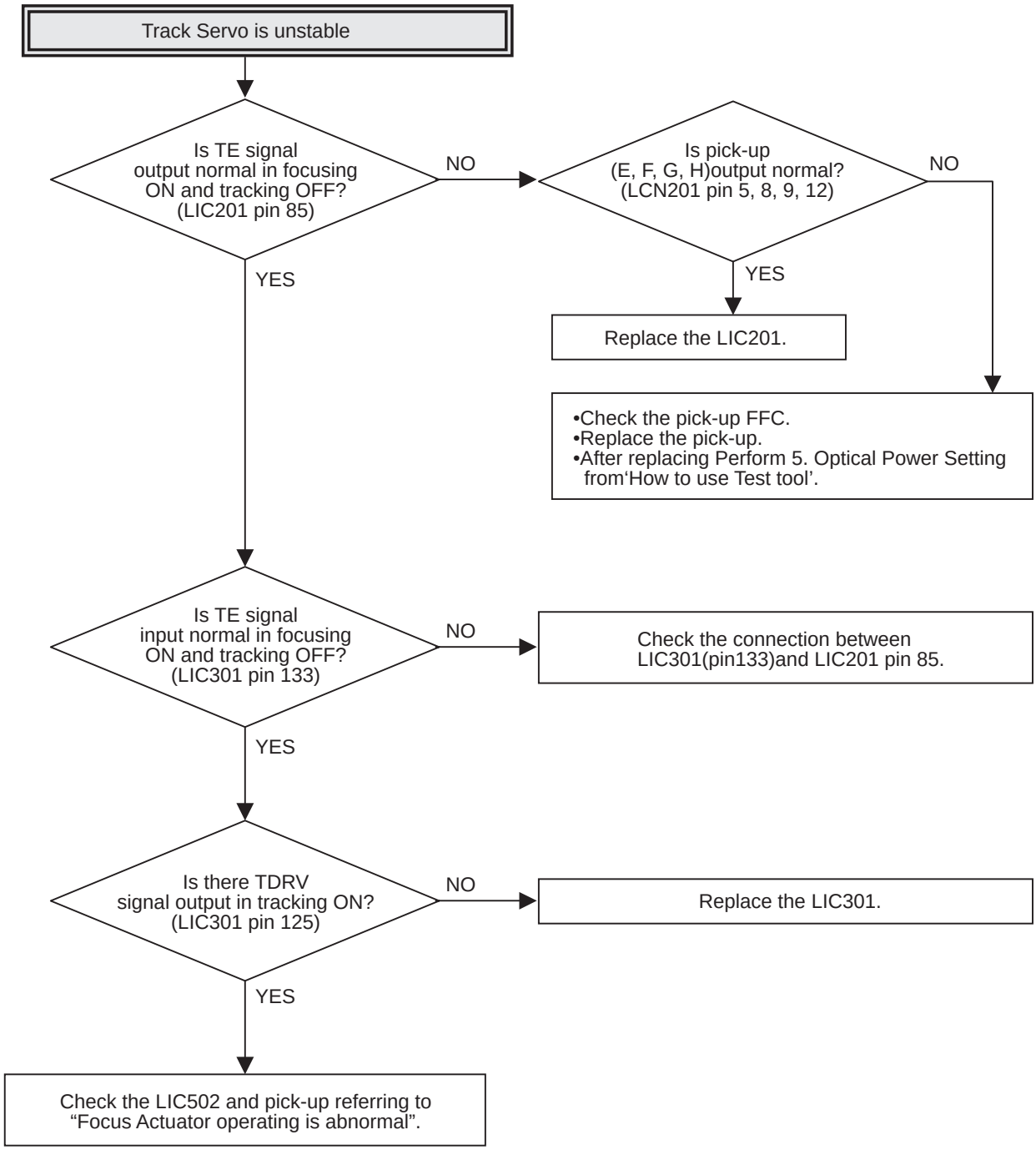

Tray operating is abnormal
Tray open doesn ’t work.
Is the
Input voltage 0V at LIC301
pin 60 when push the
EJECT SW?
NO
•Check the connection of LIC301 pin 106.
•Replace the EJECT SW.
YES
Is there tray
control signal input?
(LIC502 pin46)
NO
•Replace the LIC502.
•Check the communication line between
LIC502 and LIC301.
YES
Is there tray
drive voltage output?
(LIC502 pin 1, 2)
NO
When LCN504 is open,
Is there tray drive signal
output?
YES
YES
•Check the connector (LCN504).

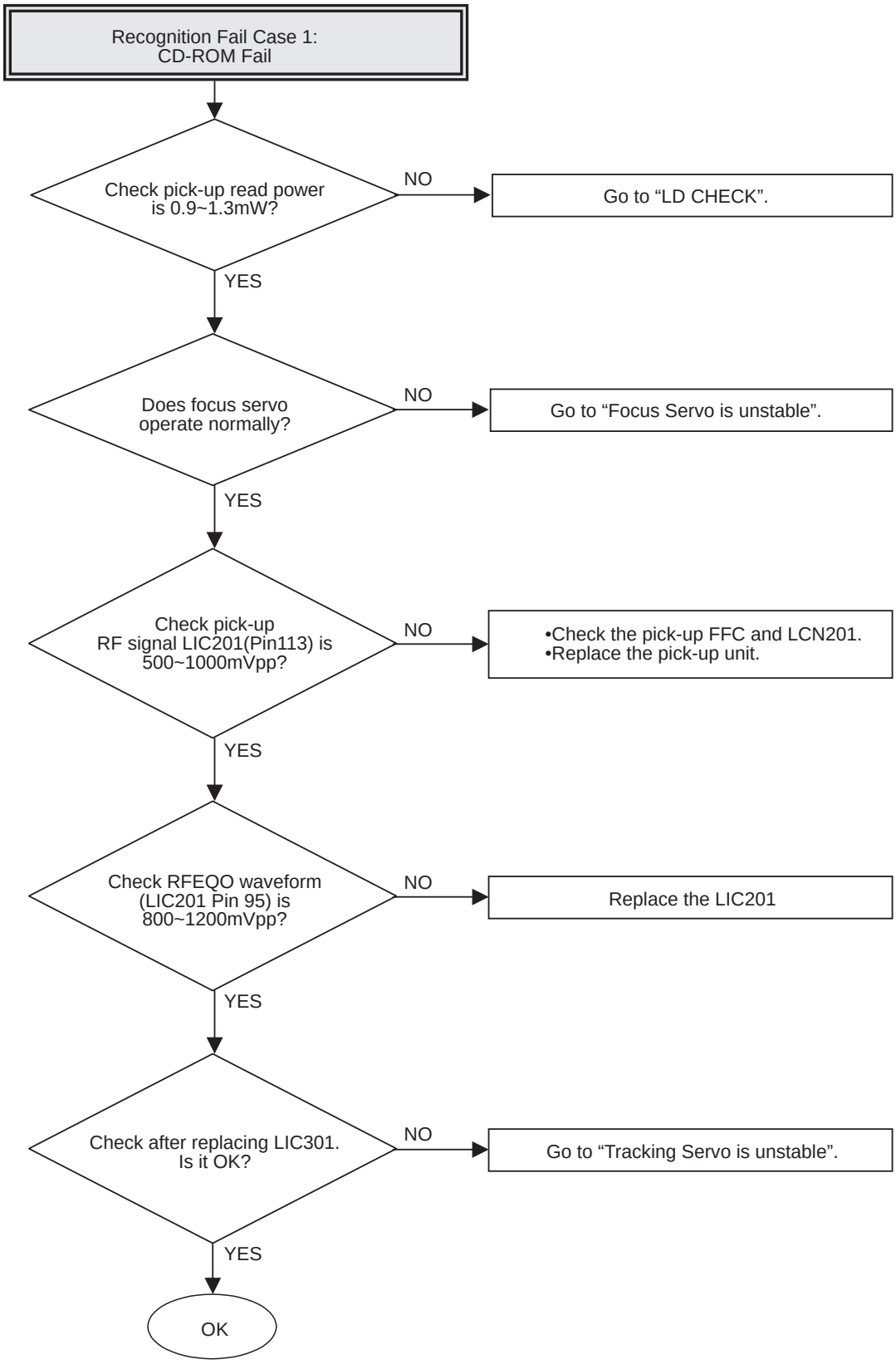

Sled operating is abnormal
Is there sled control signal output? (LIC301 pin 126, 127)
NO
Replace the LIC301
YES
Is there sled drive signal input? (LIC502 pin 29, 30)
NO
•Replace the IC102.
•Check the LR532, LR533.
YES
Is there sled drive voltage output? (LIC502 pin 37~40)
NO
Is DRV-CTRL1 signal “H”? (LIC502 pin35)
YES
Replace the LIC502
YES
Is there sled drive voltage output? (LCN501 pin 1,2,3,4)
YES
Replace the sled motor.
NO
Check the connection LCN501.

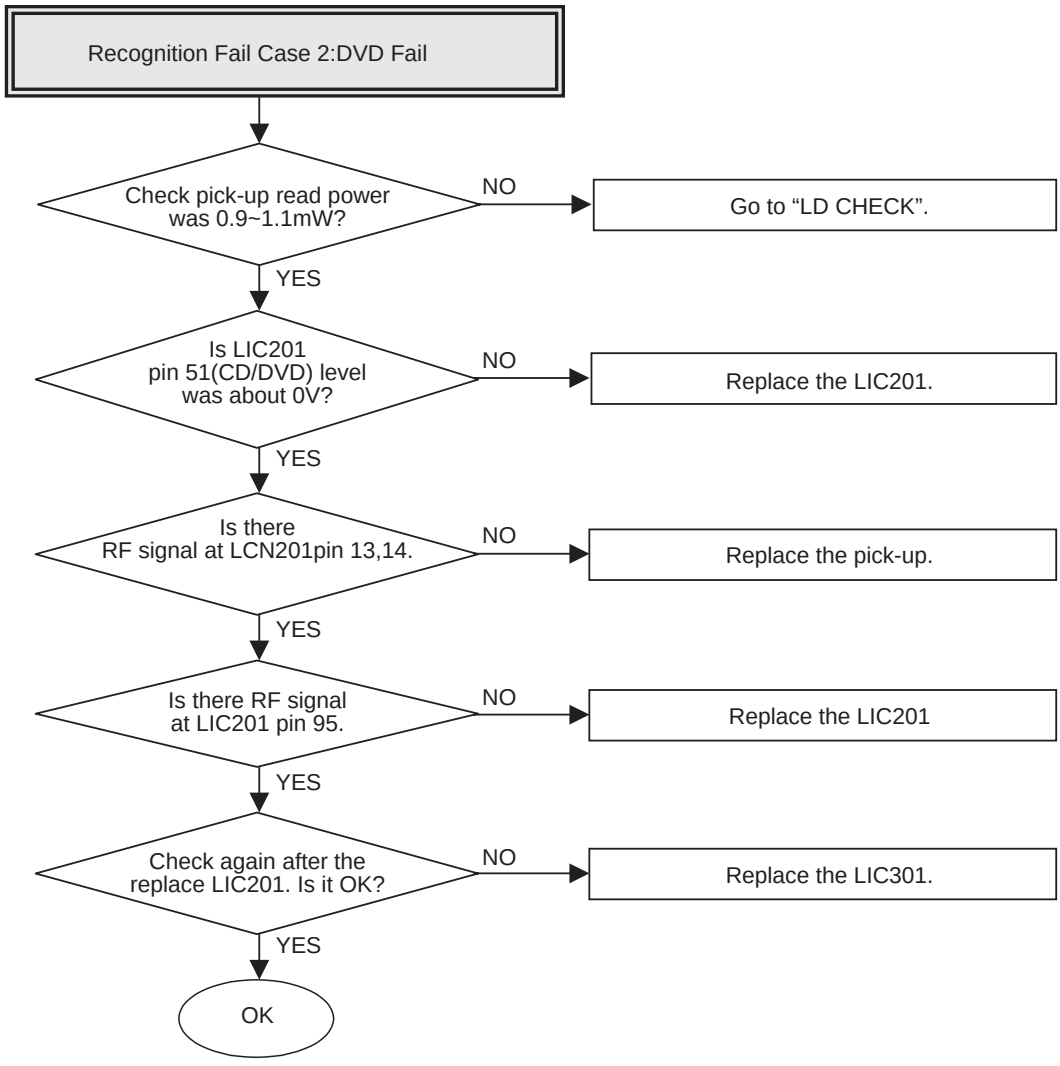

Spindle operating is abnormal
Is there spindle control signal input? (LIC502 pin 26)
NO
Is there spindle control DSP output(LIC301 pin 123)?
NO
YES
YES
•Replace the LIC301
Replace the LIC301.
Is there spindle drive voltage output? (LIC502 pin 11,13,16)
NO
Is there SFG signal input? (LIC301 pin 53)
NO
YES
YES
OK
Replace the Spindle Motor
•Replace the LIC102.

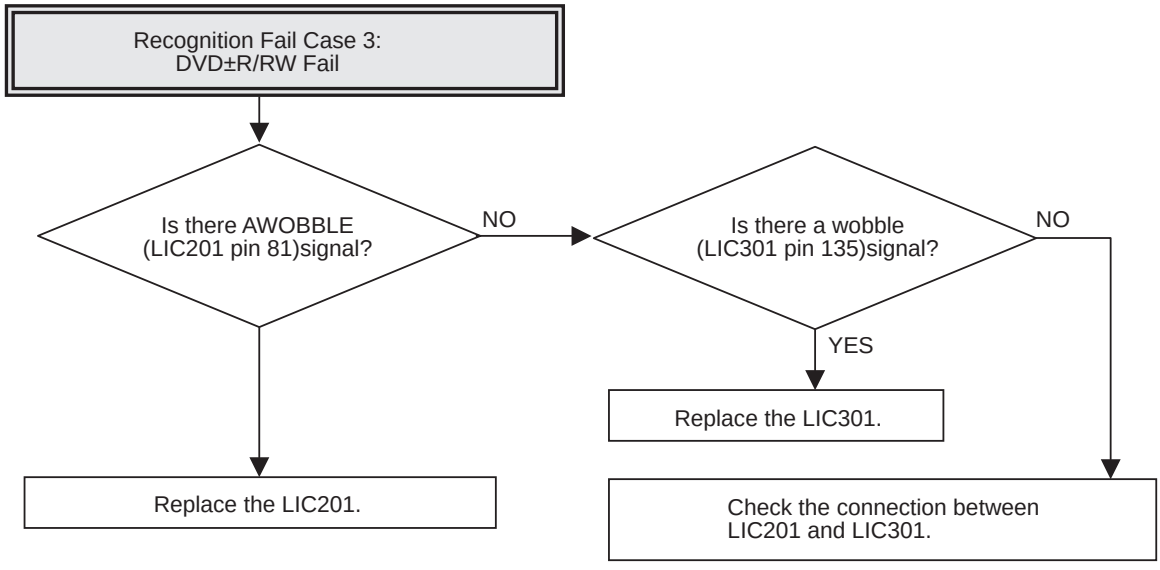

Focus Servo is unstable
Is FE signal output normal in Focusing Up/Down? (LIC201 pin 87)
NO
Replace the LIC201.
YES
Is FDRV signal output normal in Focusing Up/Down? (LIC301 pin 124)
NO
•Check the R534.
•Replace the LIC201.
YES
Go to “Focus Actuator operating is abnormal”

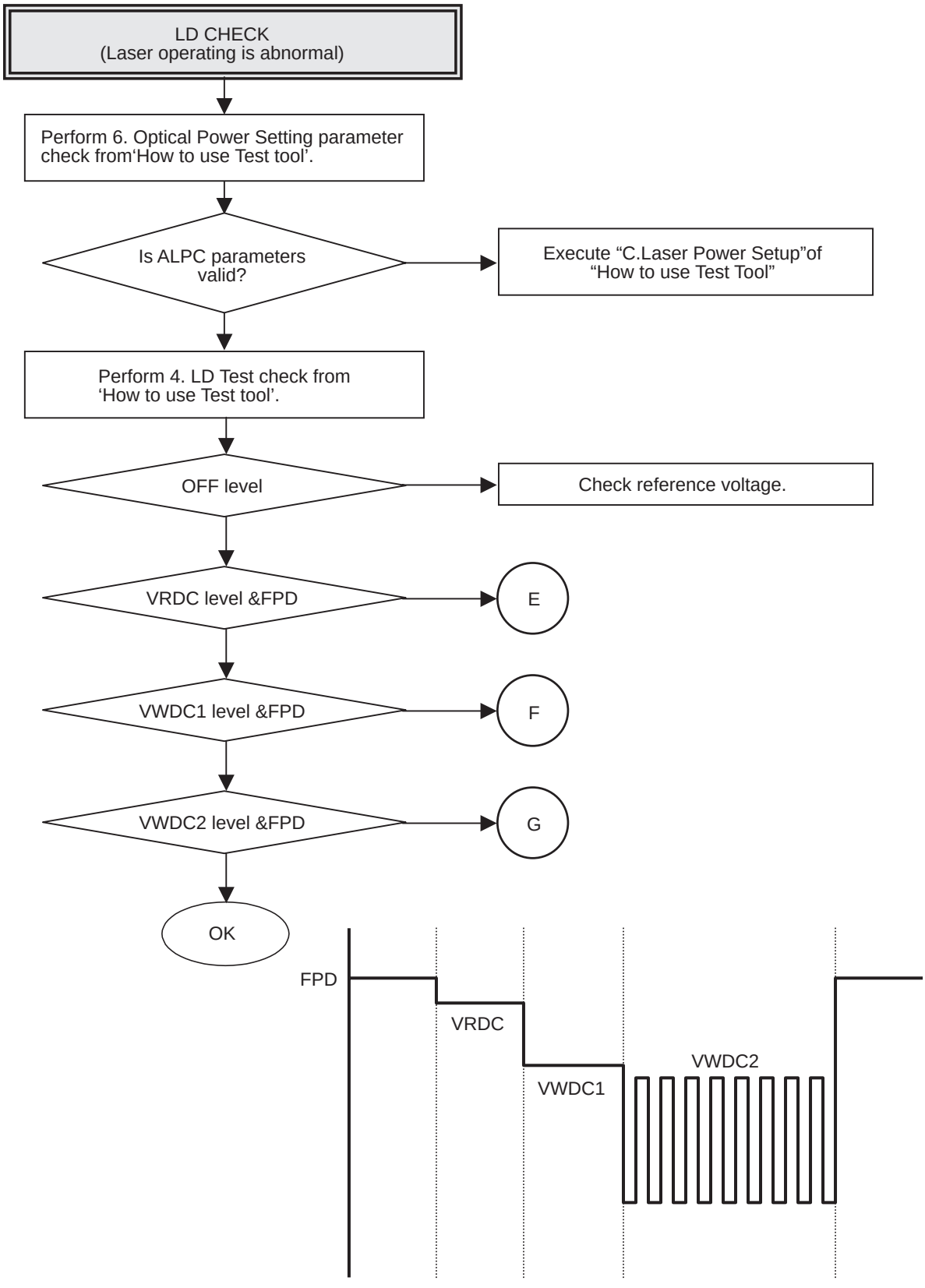

Focus Actuator operating is abnormal.
Is there focus search control signal input? (LIC502 pin 5)
NO
• Check the connection of LIC301 pin 124.
• Check the communication line between LIC205 and LIC301.
• Replace the LIC205.
YES
Is there focus search drive voltage output? (LIC502 pin 51,52)
NO
Is DRV-CTRL1 signal “H”? (LIC502 pin 35)
NO
YES
YES
•Check the connection CN102 pin 40,41.
•Check the connector LCN201.
Replace the LIC502.
• Replace the IC301.
Replace the pick-up. After replacing Perform 5. Optical Power Setting from ‘How to use Test tool’.

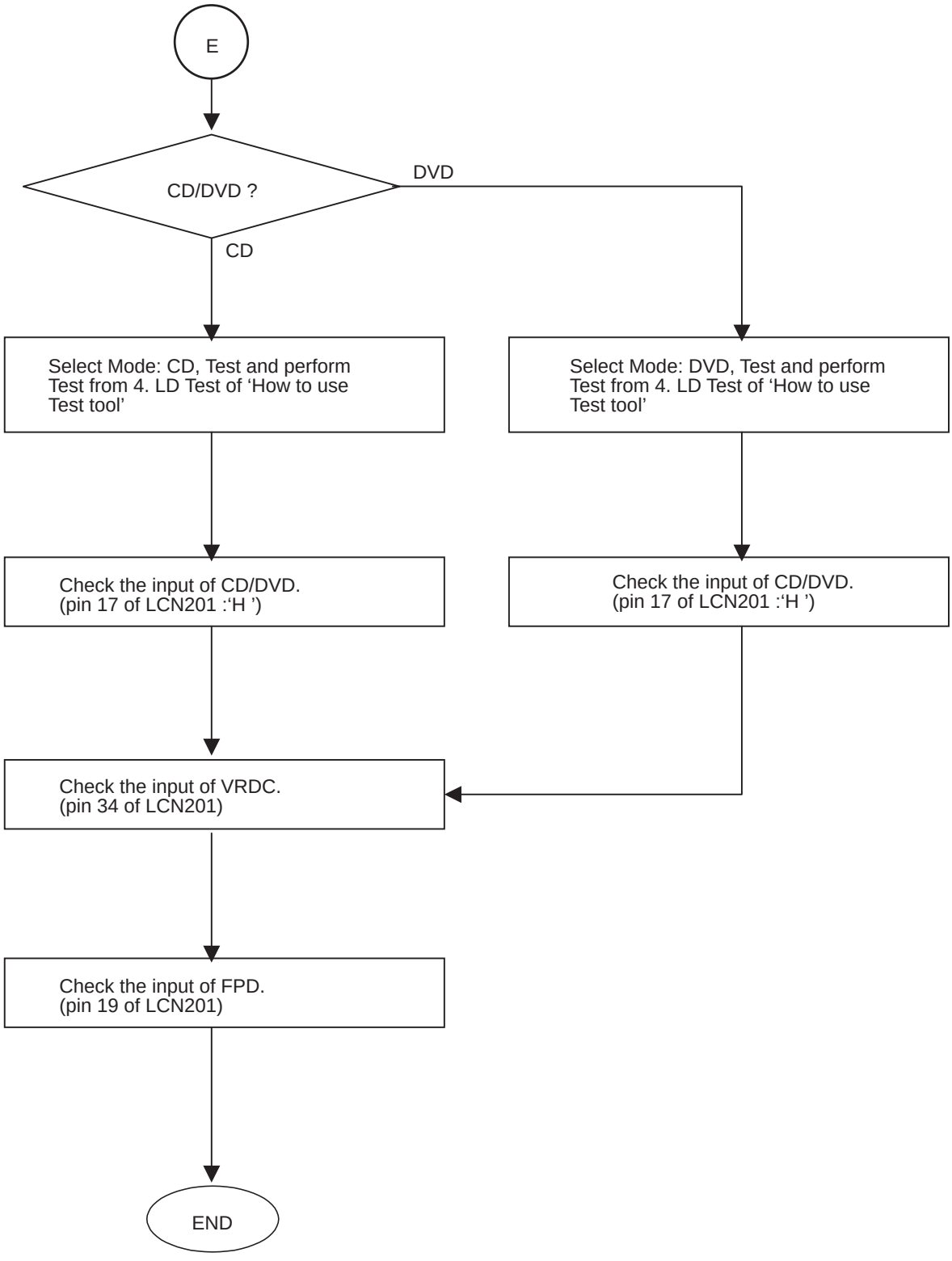

Track Servo is unstable
Is TE signal output normal in focusing ON and tracking OFF? (LIC201 pin 85)
NO
Is pick-up (E, F, G, H)output normal? (LCN201 pin 5, 8, 9, 12)
NO
YES
YES
Replace the LIC201.
•Check the pick-up FFC.
•Replace the pick-up.
•After replacing Perform 5. Optical Power Setting from‘How to use Test tool’.
Is TE signal input normal in focusing ON and tracking OFF? (LIC301 pin 133)
NO
Check the connection between LIC301(pin133)and LIC201 pin 85.
YES
Is there TDRV signal output in tracking ON? (LIC301 pin 125)
NO
Replace the LIC301.
YES
Check the LIC502 and pick-up referring to “Focus Actuator operating is abnormal”.

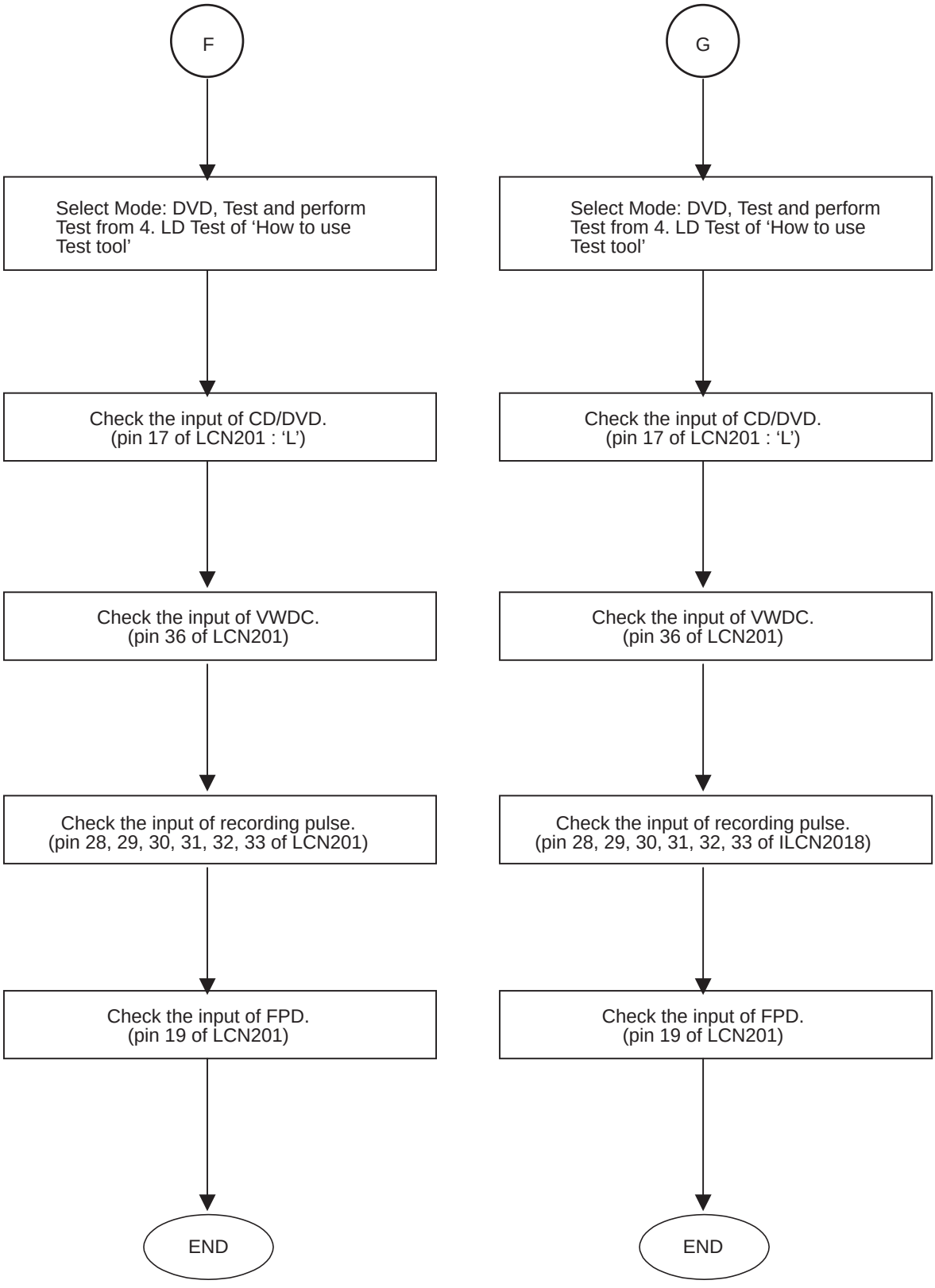

Recognition Fail Case 1:
CD-ROM Fail
Check pick-up read power is 0.9~1.3mW?
NO
Go to “LD CHECK”.
YES
Does focus servo operate normally?
NO
Go to “Focus Servo is unstable”.
YES
Check pick-up RF signal LIC201(Pin113) is 500~1000mVpp?
NO
•Check the pick-up FFC and LCN201.
•Replace the pick-up unit.
YES
Check RFEQO waveform (LIC201 Pin 95) is 800~1200mVpp?
NO
Replace the LIC201
YES
Check after replacing LIC301. Is it OK?
NO
Go to “Tracking Servo is unstable”.
YES
OK

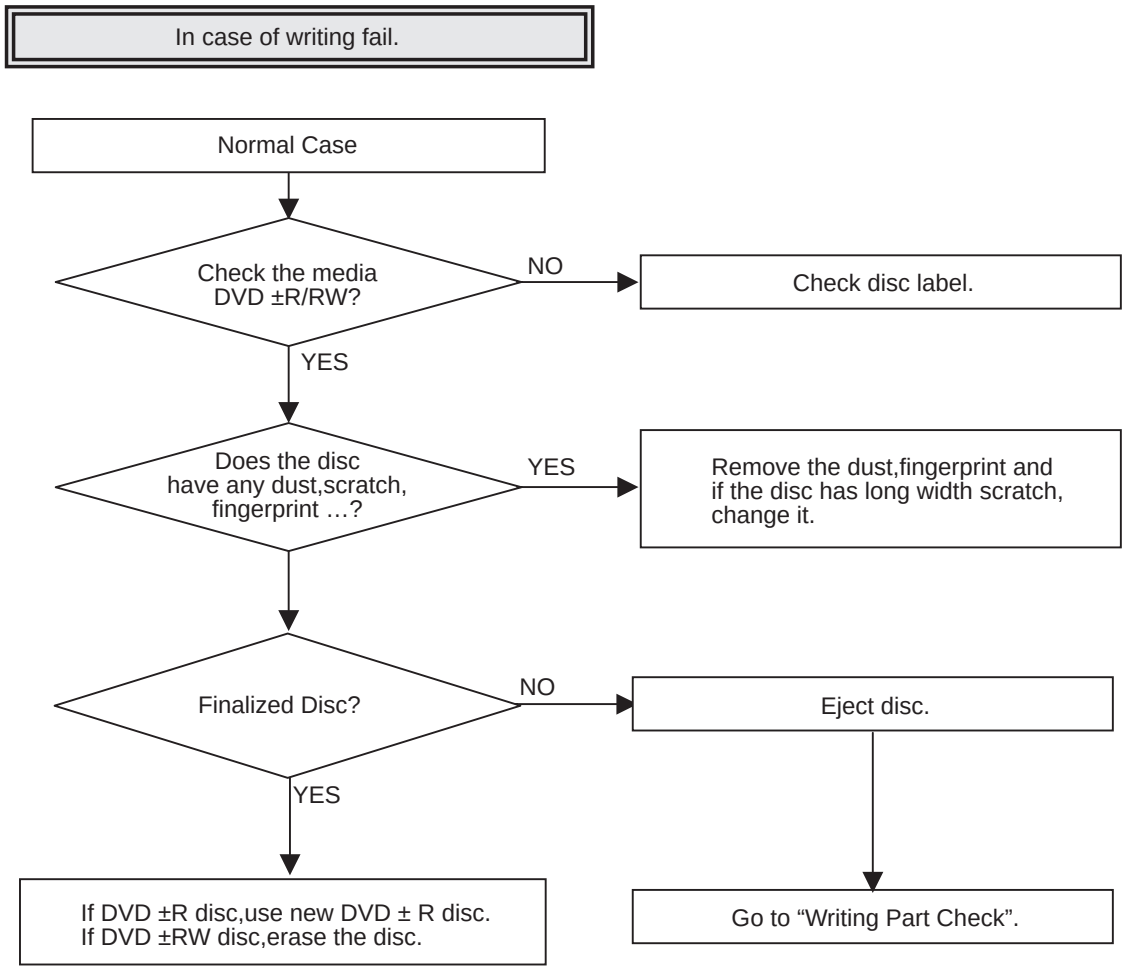

Recognition Fail Case 2:DVD Fail
Check pick-up read power was 0.9~1.1mW?
NO
Go to “LD CHECK”.
YES
Is LIC201 pin 51(CD/DVD) level was about 0V?
NO
Replace the LIC201.
YES
Is there RF signal at LCN201pin 13,14.
NO
Replace the pick-up.
YES
Is there RF signal at LIC201 pin 95.
NO
Replace the LIC201
YES
Check again after the replace LIC201. Is it OK?
NO
Replace the LIC301.
YES
OK

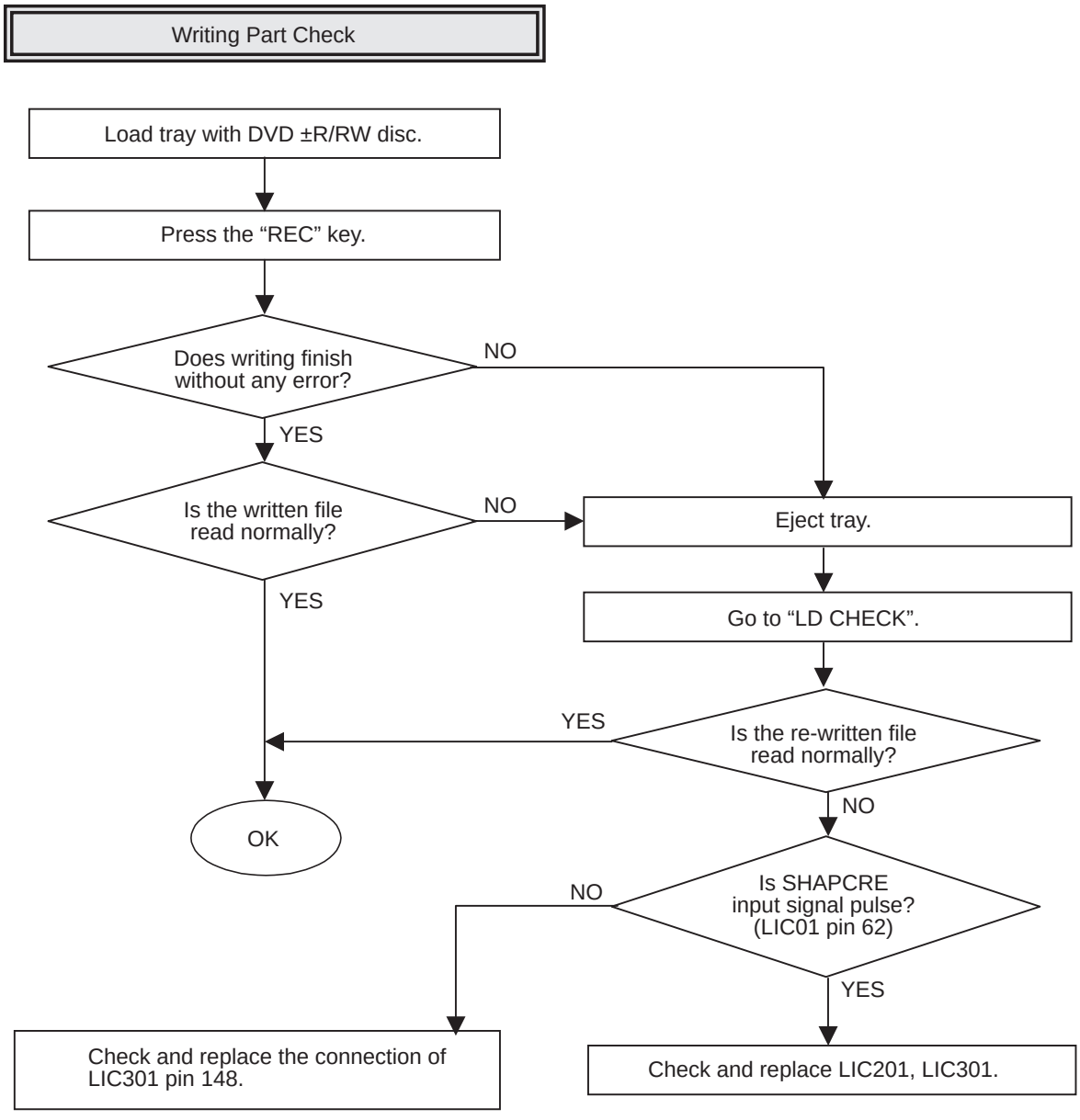

Recognition Fail Case 3: DVD±R/RW Fail
Is there AWOBBLE (LIC201 pin 81)signal?
NO
Is there a wobble (LIC301 pin 135)signal?
NO
YES
Replace the LIC301.
Replace the LIC201.
Check the connection between LIC201 and LIC301.


LD CHECK
(Laser operating is abnormal)
Perform 6. Optical Power Setting parameter check from'How to use Test tool'.
Is ALPC parameters valid?
Execute "C.Laser Power Setup"of "How to use Test Tool"
Perform 4. LD Test check from 'How to use Test tool'.
OFF level
Check reference voltage.
VRDC level &FPD
E
VWDC1 level &FPD
F
VWDC2 level &FPD
G
OK
FPD
VRDC
VWDC1
VWDC2


E
CD/DVD ?
DVD
CD
Select Mode: CD, Test and perform Test from 4. LD Test of 'How to use Test tool'
Select Mode: DVD, Test and perform Test from 4. LD Test of 'How to use Test tool'
Check the input of CD/DVD. (pin 17 of LCN201 :'H ')
Check the input of CD/DVD. (pin 17 of LCN201 :'H ')
Check the input of VRDC. (pin 34 of LCN201)
Check the input of FPD. (pin 19 of LCN201)
END

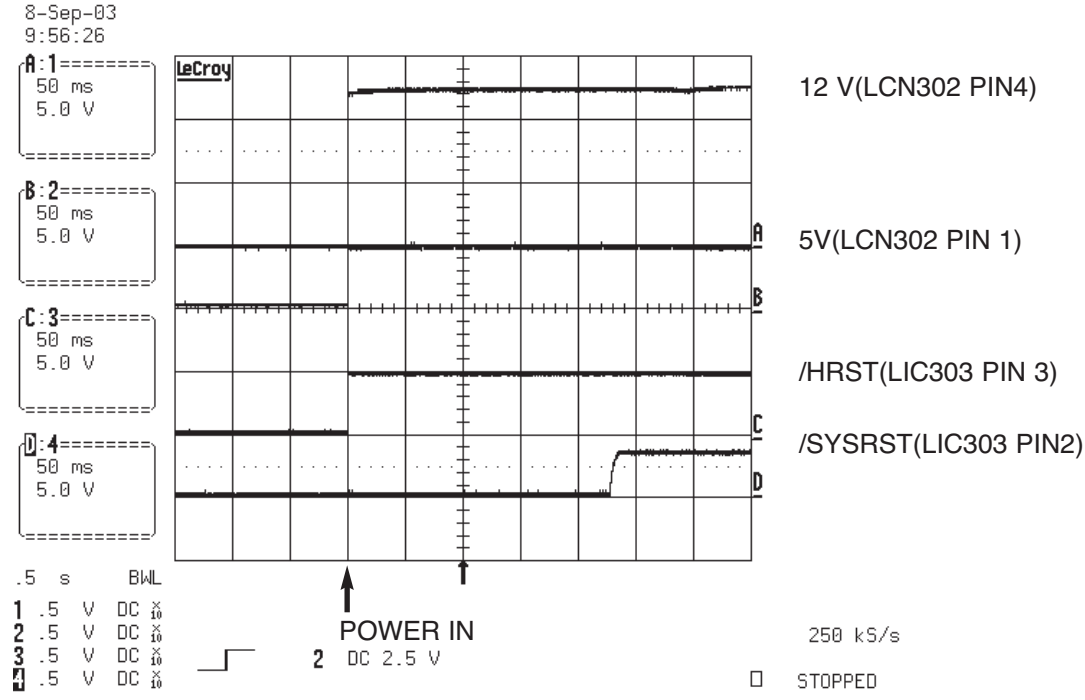

F
Select Mode: DVD, Test and perform Test from 4. LD Test of 'How to use Test tool'
Check the input of CD/DVD. (pin 17 of LCN201 : 'L')
Check the input of VWDC. (pin 36 of LCN201)
Check the input of recording pulse. (pin 28, 29, 30, 31, 32, 33 of LCN201)
Check the input of FPD. (pin 19 of LCN201)
END
G
Select Mode: DVD, Test and perform Test from 4. LD Test of 'How to use Test tool'
Check the input of CD/DVD. (pin 17 of LCN201 : 'L')
Check the input of VWDC. (pin 36 of LCN201)
Check the input of recording pulse. (pin 28, 29, 30, 31, 32, 33 of ILCN2018)
Check the input of FPD. (pin 19 of LCN201)
END


In case of writing fail.
Normal Case
Check the media
DVD ±R/RW?
NO
Check disc label.
YES
Does the disc
have any dust,scratch,
fingerprint …?
YES
Remove the dust,fingerprint and
if the disc has long width scratch,
change it.
Finalized Disc?
NO
Eject disc.
YES
If DVD ±R disc,use new DVD ± R disc.
If DVD ±RW disc,erase the disc.
Go to “Writing Part Check”.

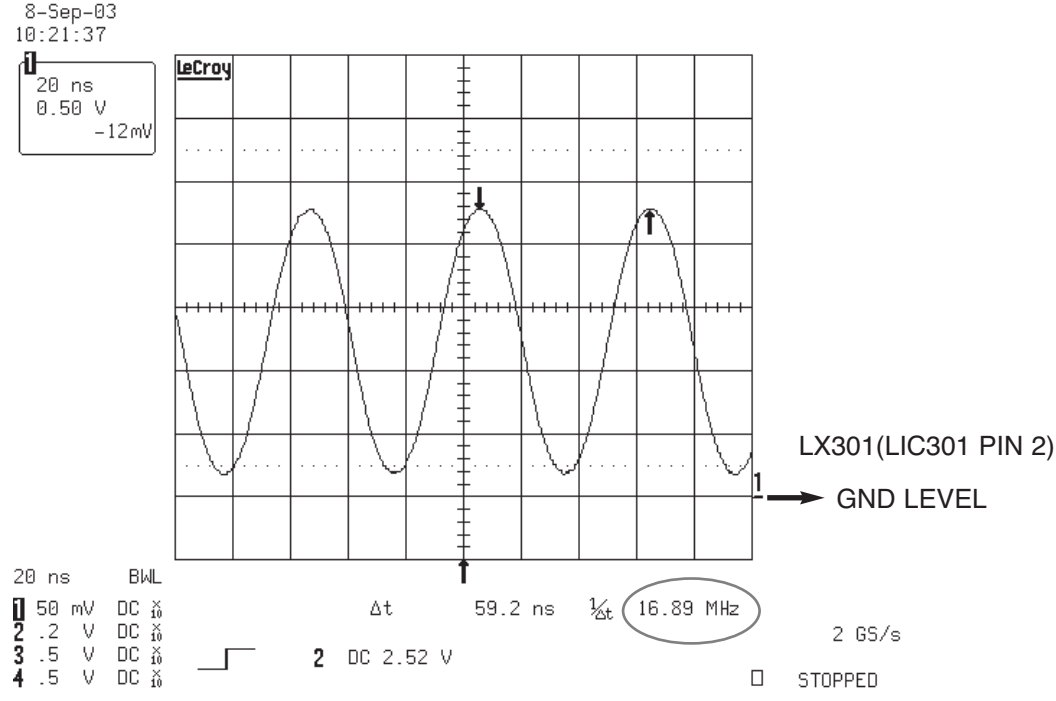

Writing Part Check
Load tray with DVD ±R/RW disc.
Press the “REC” key.
Does writing finish without any error?
NO
YES
Is the written file read normally?
NO
Eject tray.
YES
Go to “LD CHECK”.
Is the re-written file read normally?
YES
NO
OK
Is SHAPCRE input signal pulse? (LIC01 pin 62)
NO
YES
Check and replace the connection of LIC301 pin 148.
Check and replace LIC201, LIC301.

WAVEFORMS

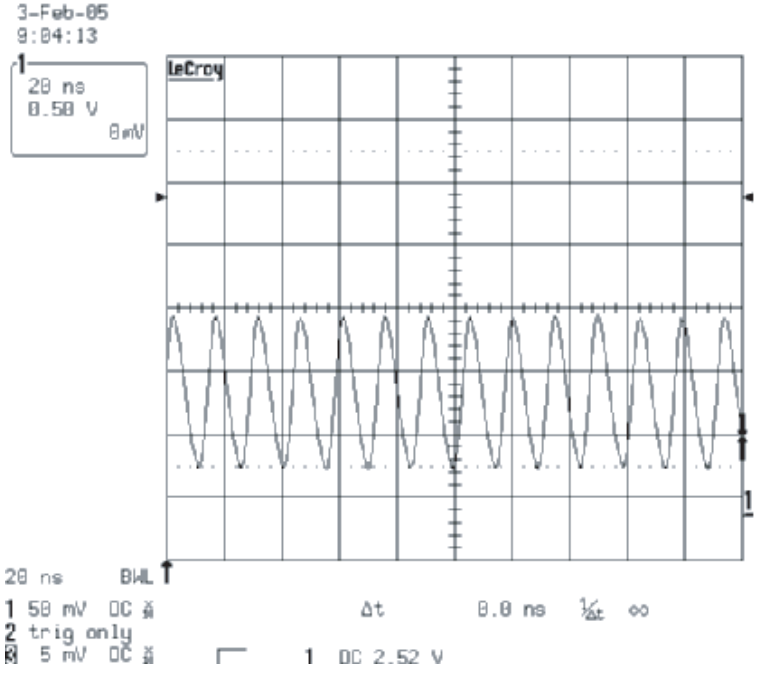
1. POWER & RESET Signal



2. Main Clock1 for IC202 (16.9MHz)

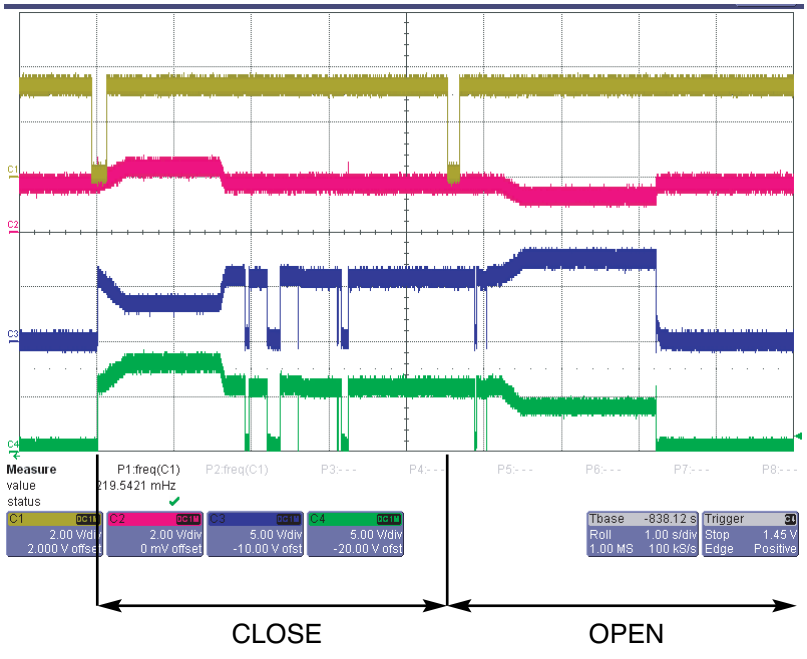


3. SDRAM Clock



MCLK(LIC304 PIN 35)

4. TRAY OPEN/CLOSE SIGNAL 1



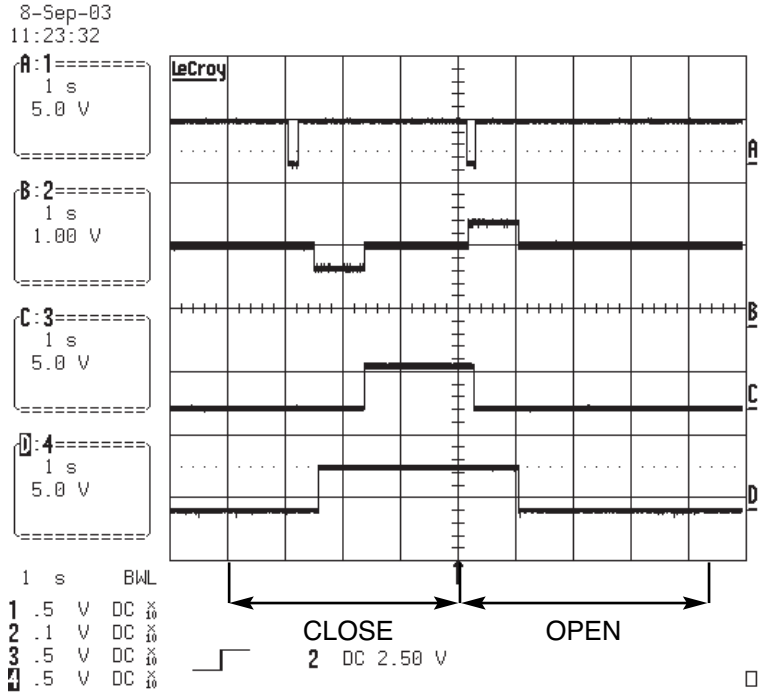
/EJECT-KEY (LR504)

TRAY-CTRL
(LIC502 PIN46)

TRAY+(LCN504 PIN 3)

TRAY-(LCN504 PIN 4)

5. TRAY OPEN/CLOSE SIGNAL 2



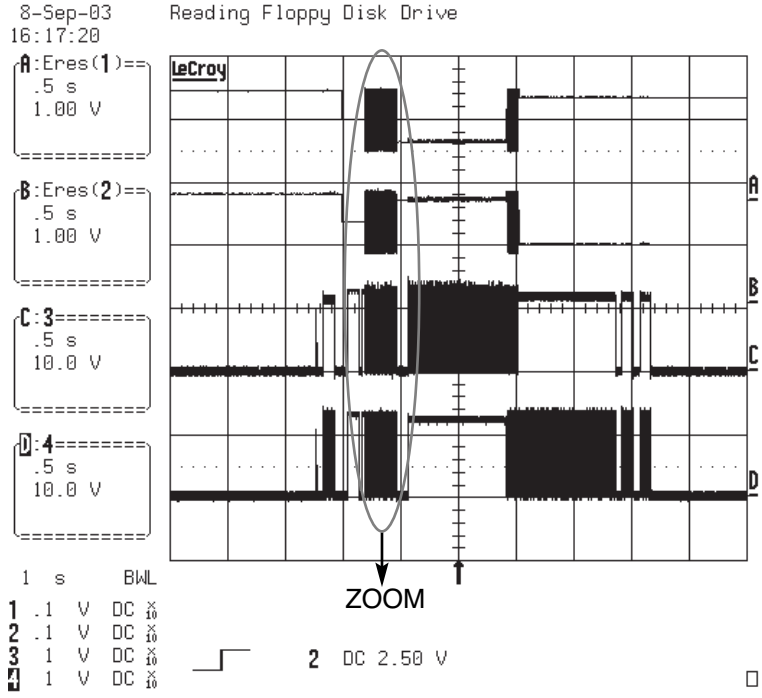
/EJECT-KEY(LR504)

TRAY-CTRL(LIC502 PIN46)

/OPEN-SW(LCN504 PIN 1)

/LOAD-SW
(LCN504 PIN 2)

6. SLED MOVE SIGNAL 1



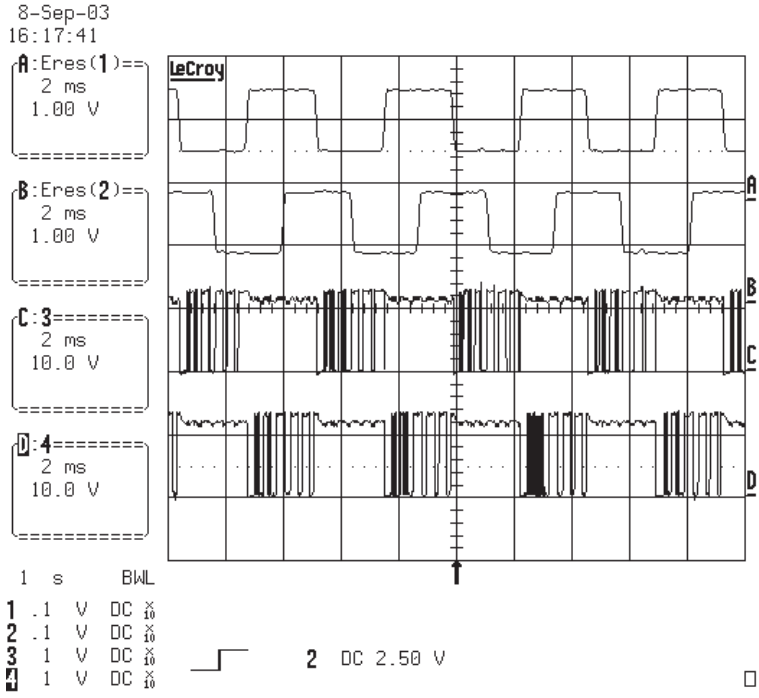
SDRV2(LIC502 PIN31)

SDRV1(LIC107 PIN29)

A+(LCN501PIN 2)

A-(LCN1501 PIN 1)

7. SLED MOVE SIGNAL 2



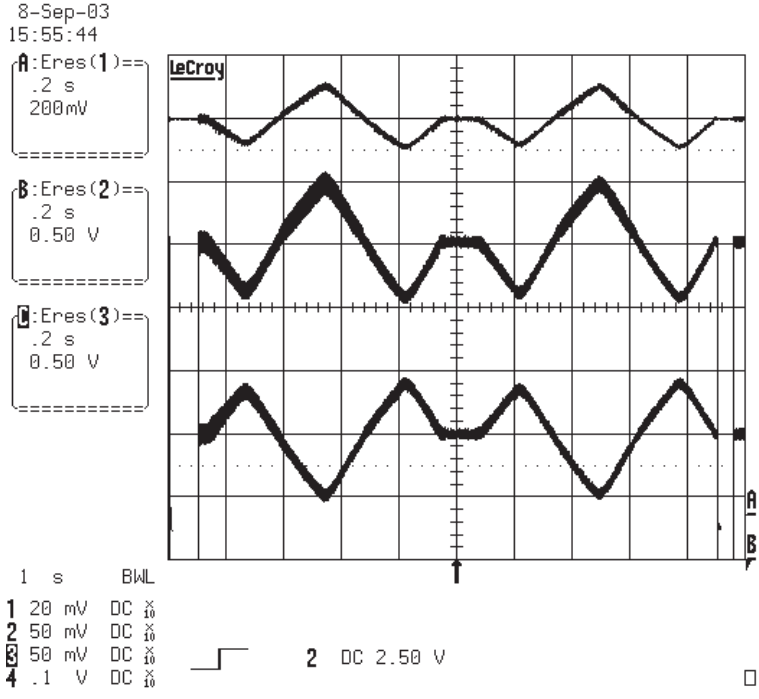
SDRV2(LIC502 PIN31)

SDRV1(LIC107 PIN29)

A+(LCN501PIN 2)

A-(LCN1501 PIN 1)

8. FOCUS SEARCH SIGNAL

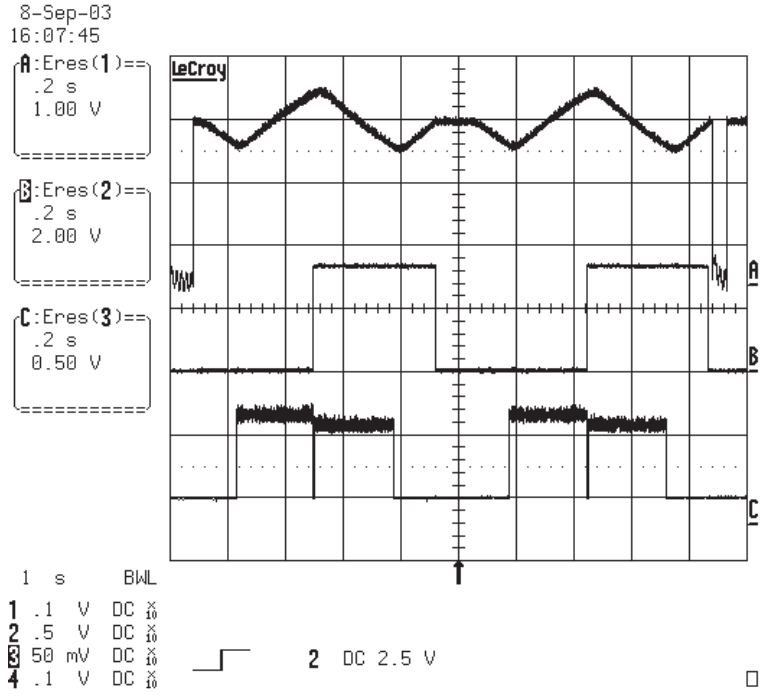


FDRV (LIC502 PIN 5)

F+ (LIC502 PIN 52)

F- (LIC502 PIN 51)

9. LASER TURN ON SIGNAL

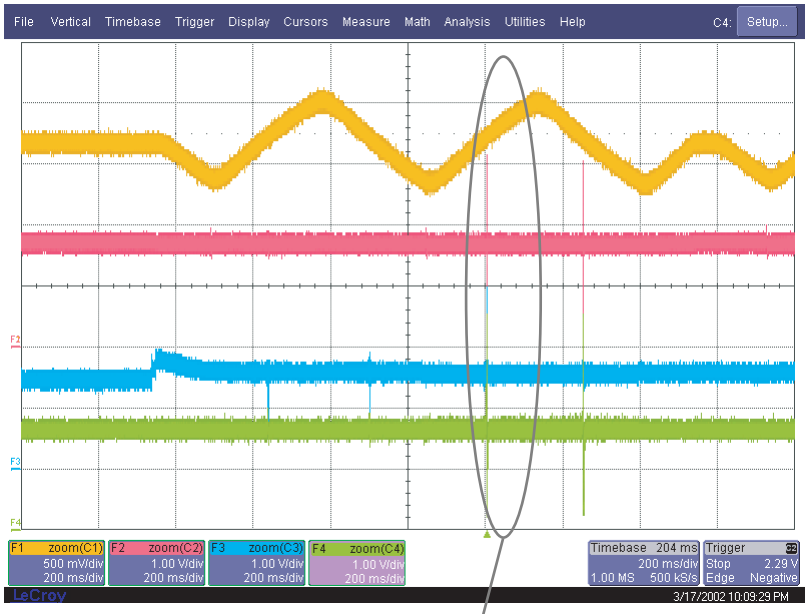


F+ (LIC502 PIN 52)

LDEN-DVD(LCN201 PIN17)

VRDC(LCN201PIN 34)

10. DISC TYPE JUDGEMENT WAVEFORM (CD SERIES)



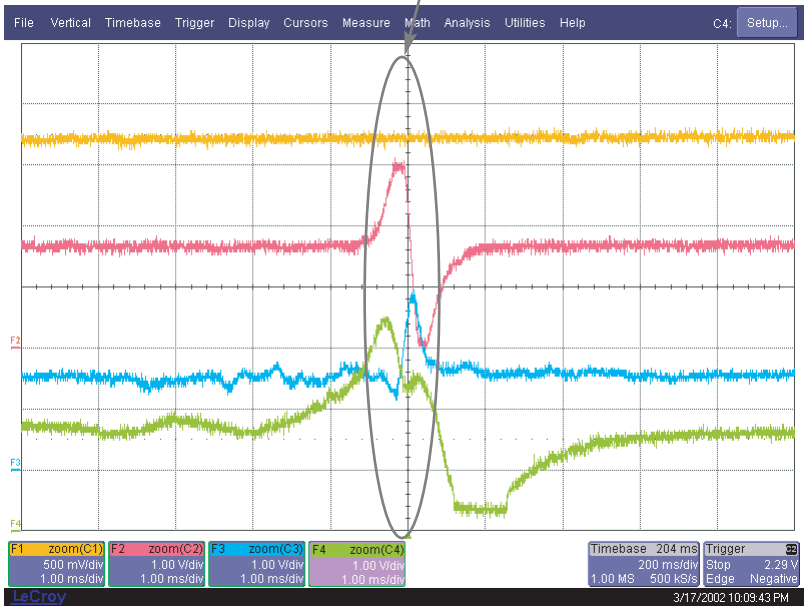
FDRV(LIC502 PIN 5)

FE(LIC201 PIN87)

TE(LIC201 PIN85)

RF(LIC201PIN 113)

11. DISC TYPE JUDGEMENT WAVEFORM (CD&CD-R)



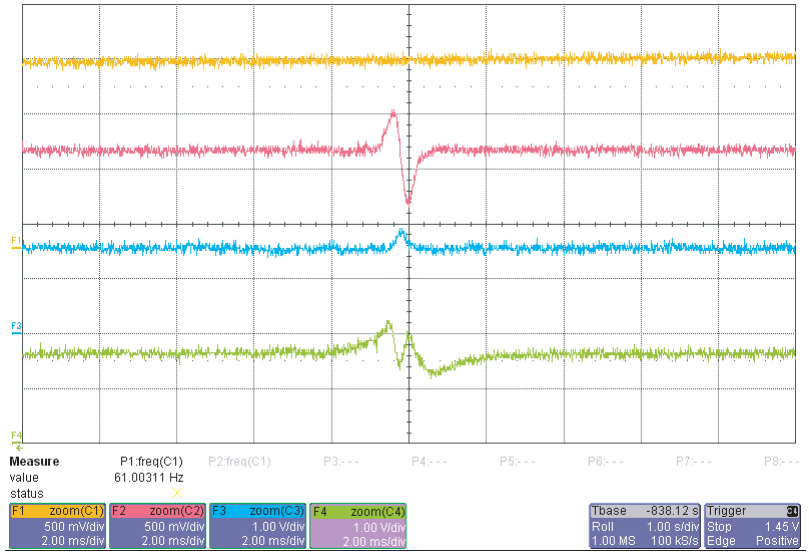
FDRV(LIC502 PIN 5)

FE(LIC201 PIN87)

TE(LIC201 PIN85)

RF(LIC201PIN 113)

12. DISC TYPE JUDGEMENT WAVEFORM (CD-RW)



FDRV(LIC502 PIN 5)

FE(LIC201 PIN87)

TE(LIC201 PIN85)

RF(LIC201PIN 113)

13. DISC TYPE JUDGEMENT WAVEFORM (DVD SERIES)

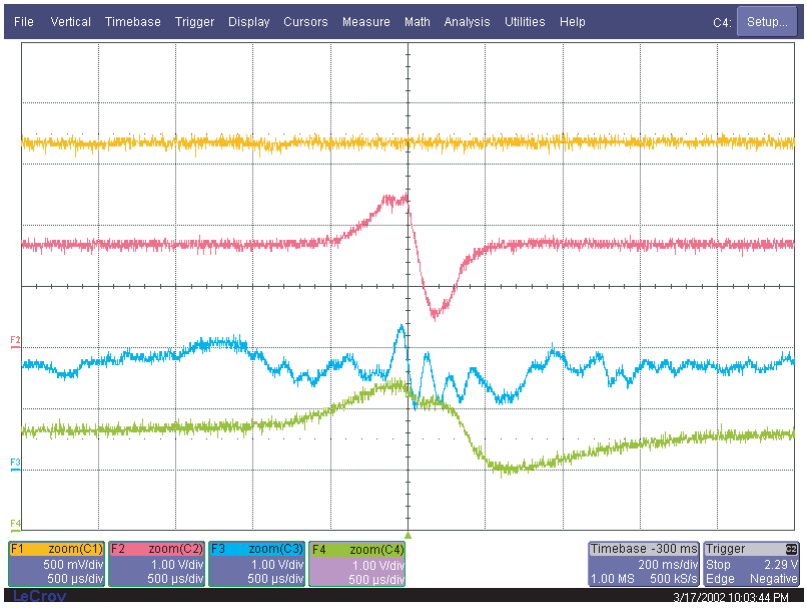
FDRV(LIC502 PIN 5)

FE(LIC201 PIN87)

TE(LIC201 PIN85)

RF(LIC201PIN 113)

14. DISC TYPE JUDGEMENT WAVEFORM (DVD_SINGLE&R)



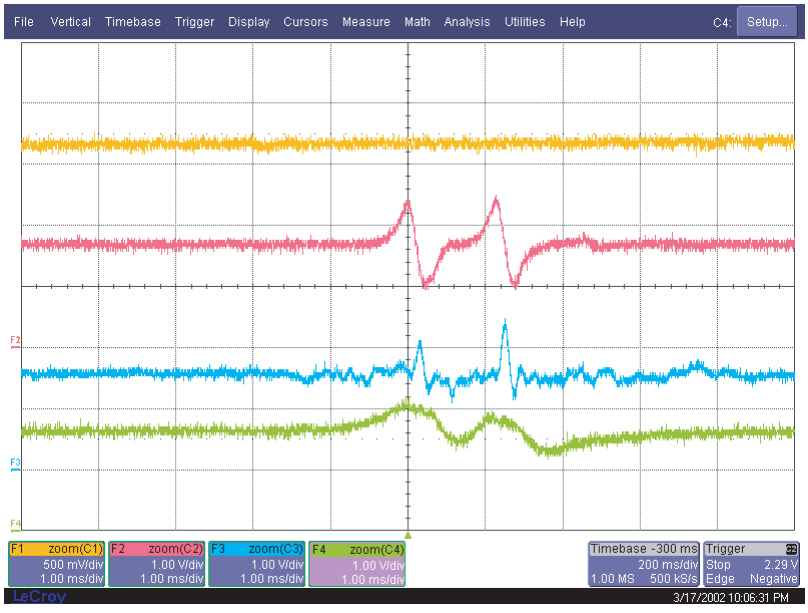
FDRV(LIC502 PIN 5)

FE(LIC201 PIN87)

TE(LIC201 PIN85)

RF(LIC201PIN 113)

15. DISC TYPE JUDGEMENT WAVEFORM (DVD _DUAL)



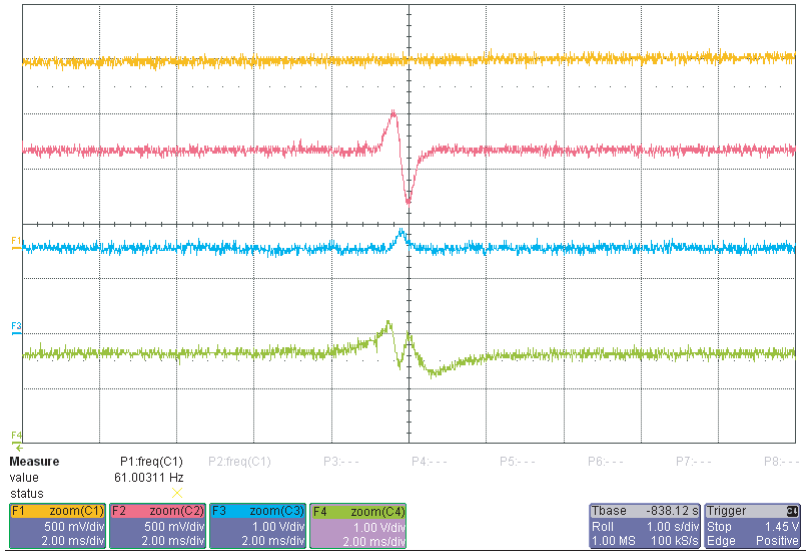
FDRV(LIC502 PIN 5)

FE(LIC201 PIN87)

TE(LIC201 PIN85)

RF(LIC201PIN 113)

16. DISC TYPE JUDGEMENT WAVEFORM (DVDRW)



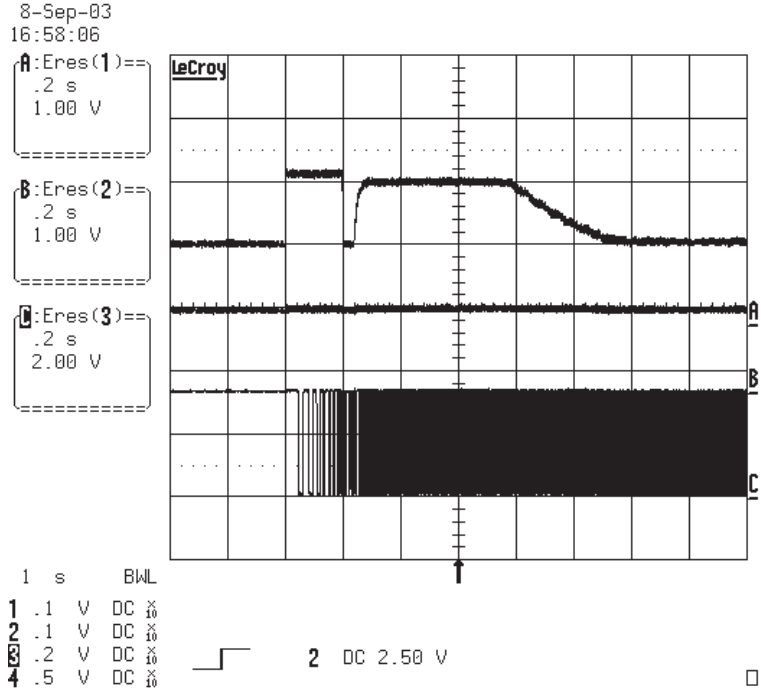
FDRV(LIC502 PIN 5)

FE(LIC201 PIN87)

TE(LIC201 PIN85)

RF(LIC201PIN 113)

17. SPINDLE WAVEFORM1

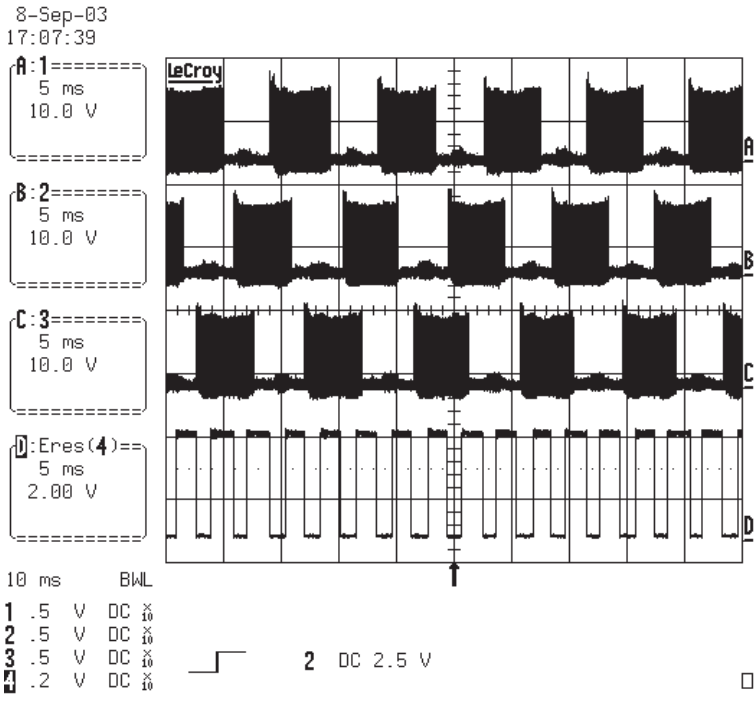


MDRV (LIC502 PIN 26)

REFOUT (LIC502 PIN 42)

SFG((LIC502 PIN43)

18. SPINDLE WAVEFORM2



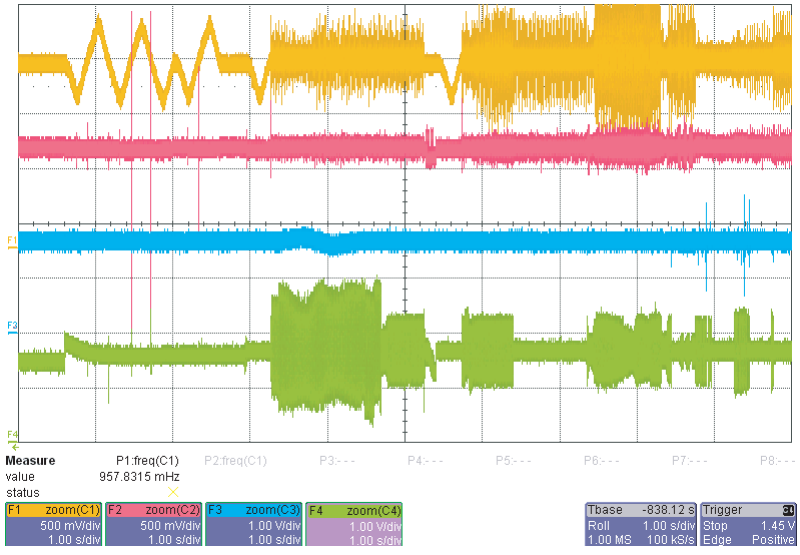
U((LIC502 PIN11)

V((LIC502 PIN13)

W((LIC502 PIN16)

SFG(LIC502 PIN43)

19. FOCUS ON SIGNAL(CD)



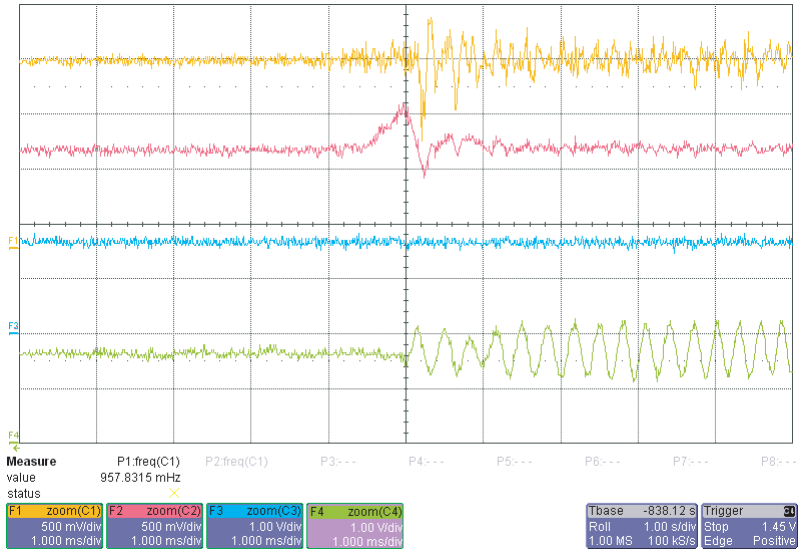
FDRV (LIC301 PIN 124)

FE (LIC201 PIN87)

TDRV (LIC301 PIN 125)

TE (LIC201 PIN85)

20. FOCUS ON SIGNAL(CD)



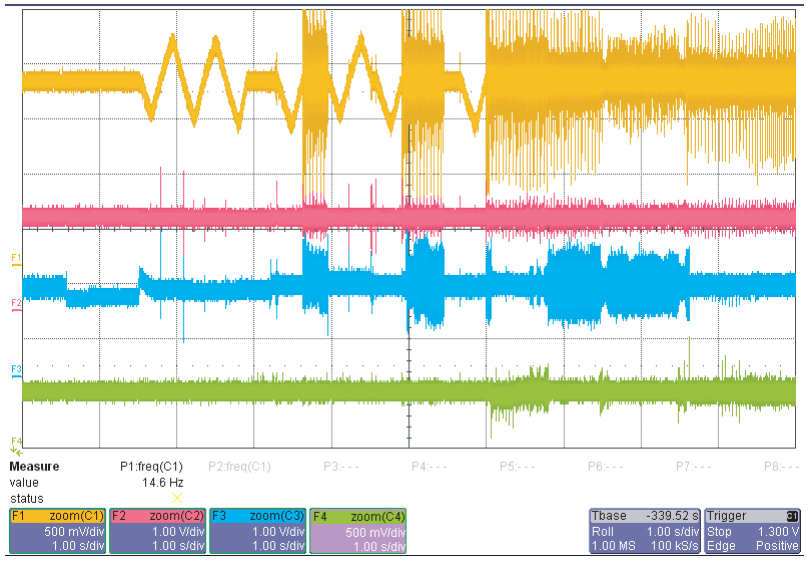
FDRV (LIC301 PIN 124)

FE (LIC201 PIN87)

TDRV (LIC301 PIN 125)

TE (LIC201 PIN85)

21. FOCUS ON SIGNAL(DVD)



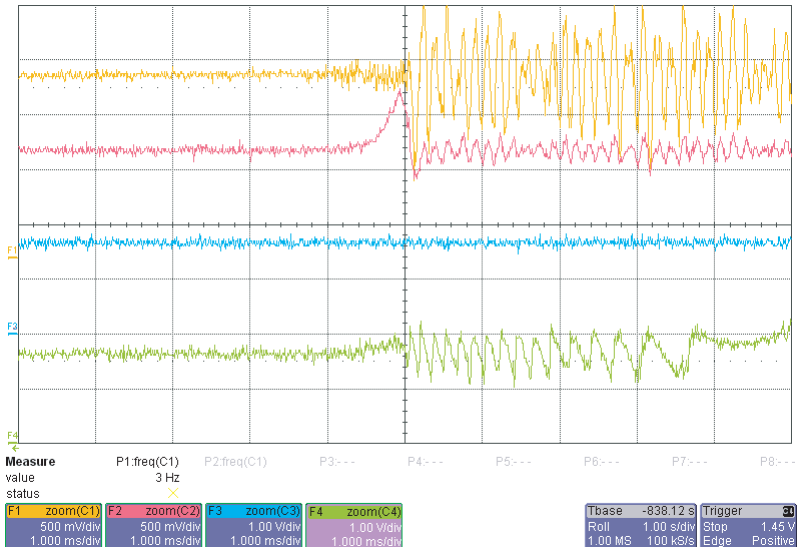
FDRV (LIC301 PIN 124)

FE (LIC201 PIN87)

TDRV (LIC301 PIN 125)

TE (LIC201 PIN85)

22. FOCUS ON SIGNAL (DVD)



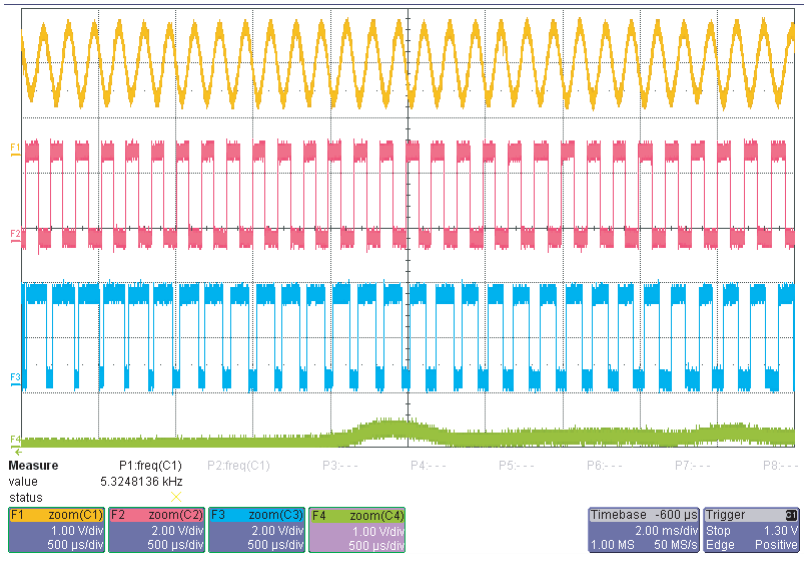
FDRV (LIC301 PIN 124)

FE (LIC201 PIN87)

TDRV (LIC301 PIN 125)

TE (LIC201 PIN85)

23. TRACK OFF SIGNAL(CD)

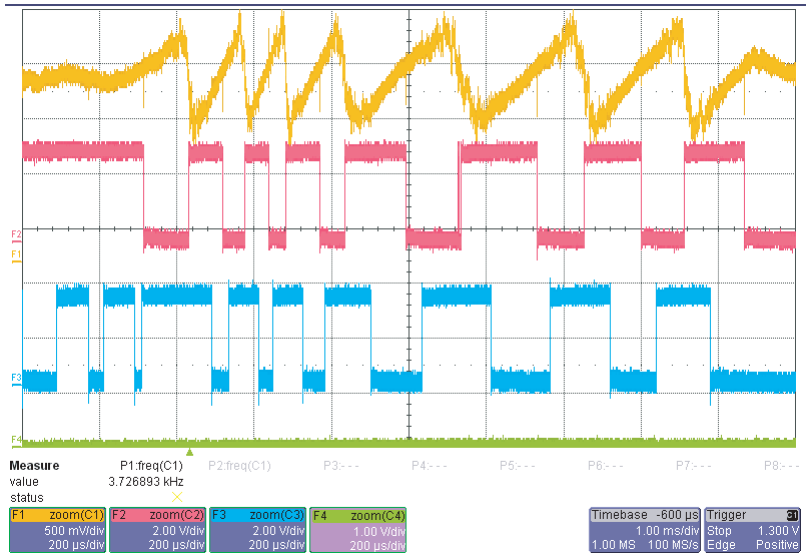


TE (LIC106 PIN85)

TZC(LIC106 PIN74)

MIRRBCA(LIC106 PIN77)

24. TRACK OFF SIGNAL(DVD)

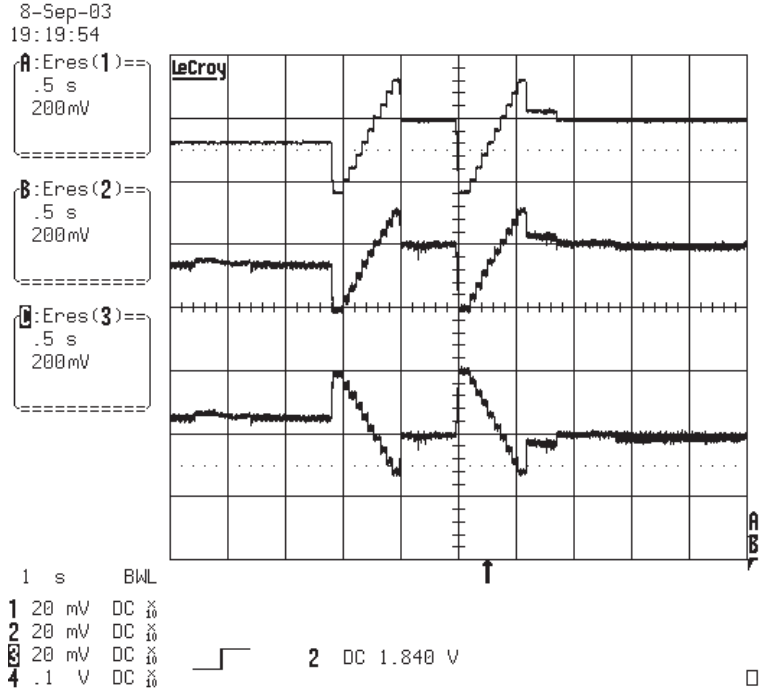


TE (LIC106 PIN85)

TZC(LIC106 PIN74)

MIRRBCA(LIC106 PIN77)

25. Tilt Driver signal(Disc reading)

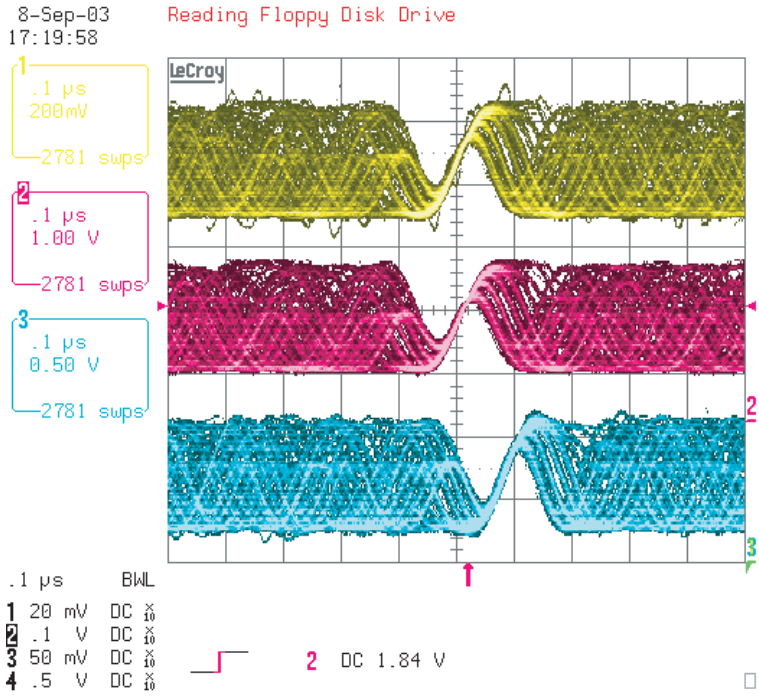


TILTDRV(LIC502 PIN47)

TILT+(LIC502 PIN50)

TILT-(LIC502 PIN49)

26. RF WAVEFORM(DVD)

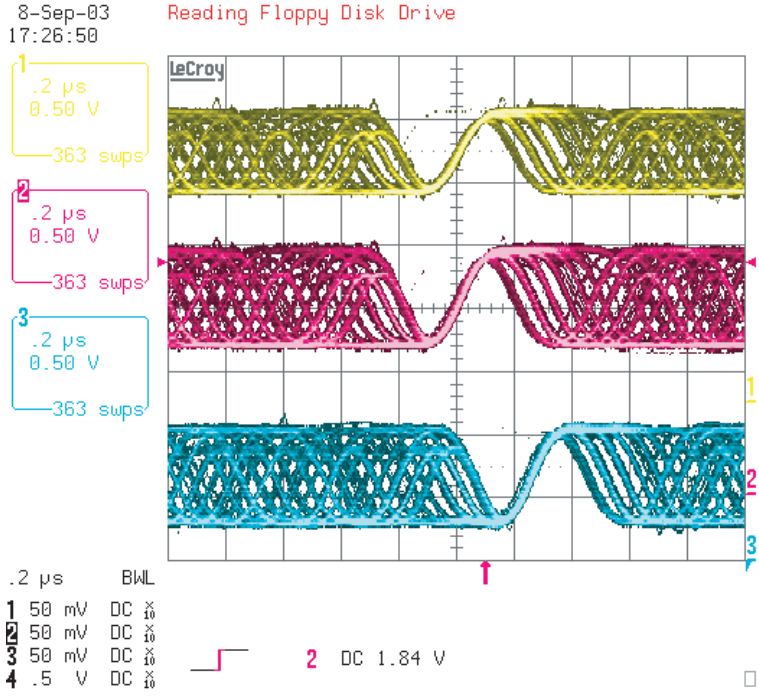


RFP(LIC201 PIN2)

RFO(LIC201PIN 113)

RFI(LIC201 PIN 95)

27. RF WAVEFORM(CD)

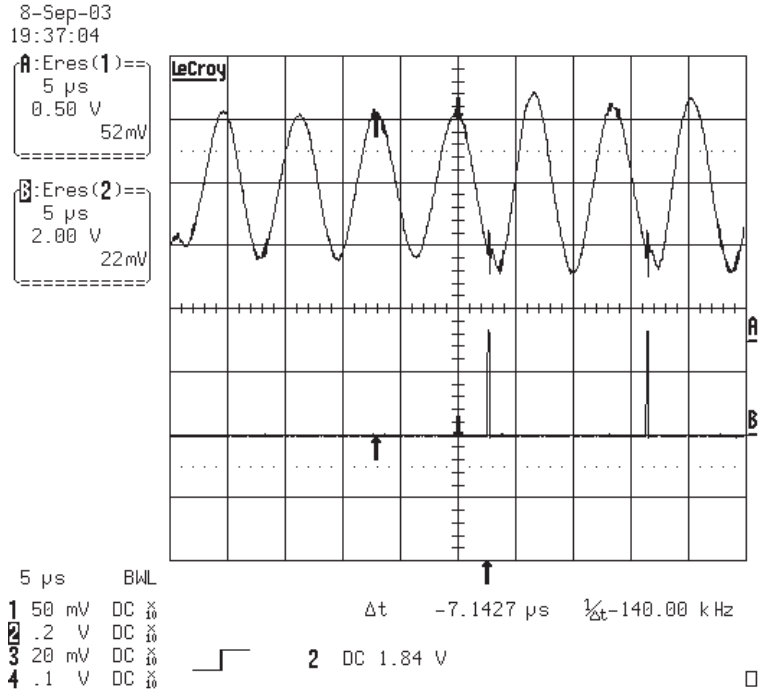


RFP(LIC201 PIN2)

RFO(LIC201PIN 113)

RFI(LIC201 PIN 95)

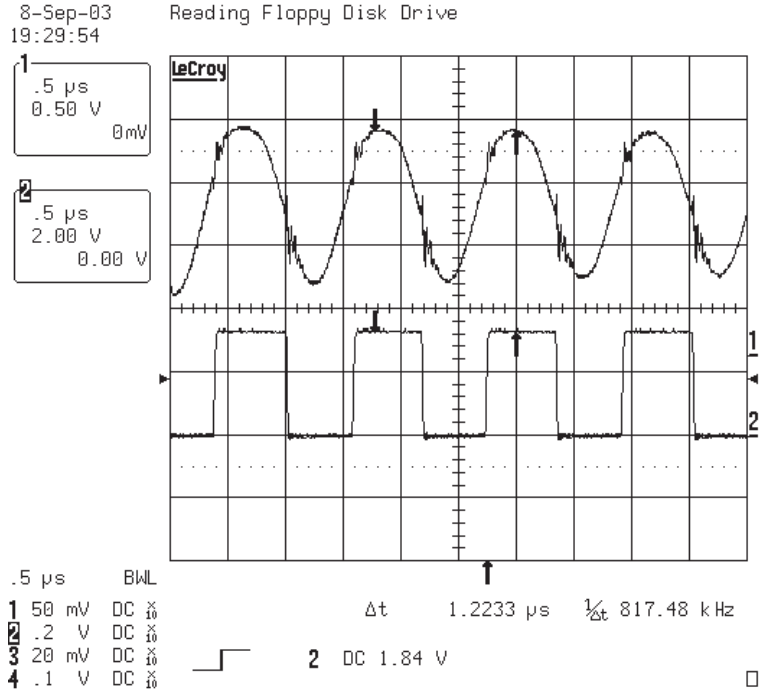
28. WOBBLE(DVD-R/RW)_READING



AWOBBLE(LIC201 PIN81)

LPP/HEAD(LIC201 PIN 73)

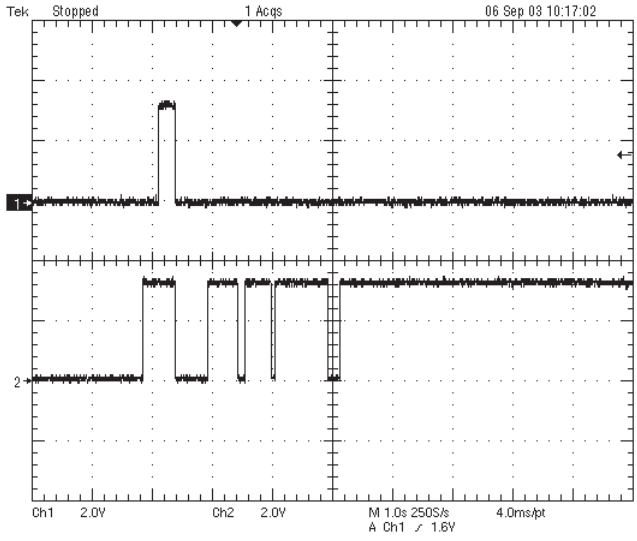
29. WOBBLE(DVD+R/RW)_READING& WRITING => X1 SPEED



AWOBBLE(LIC201 PIN81)

LPP/HEAD(LIC201PIN 73)

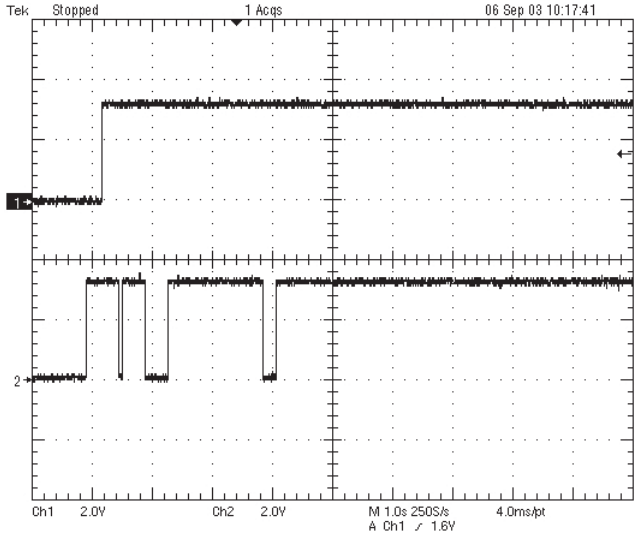
30. LD Enable(DVD)



CD/DVD(LCN201 PIN 17)

LDEN(LCN PIN 38)

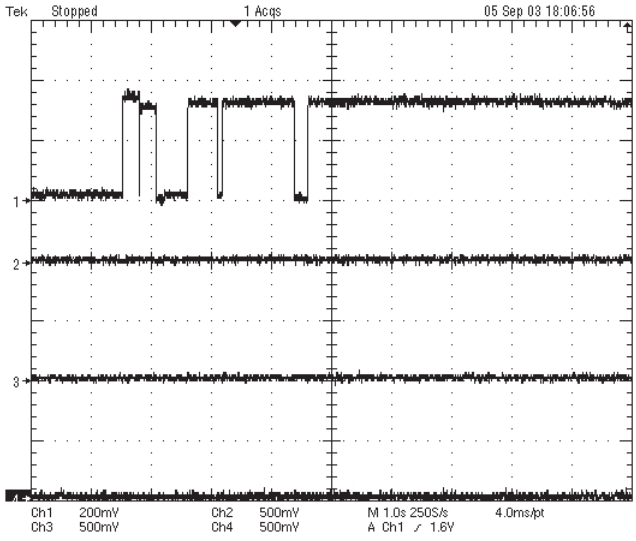
31. LD Enable(CD)



CD/DVD(LCN201 PIN 17)

LDEN(LCN102 PIN 38)

32. Laser Power(reading) _ DVD+RW



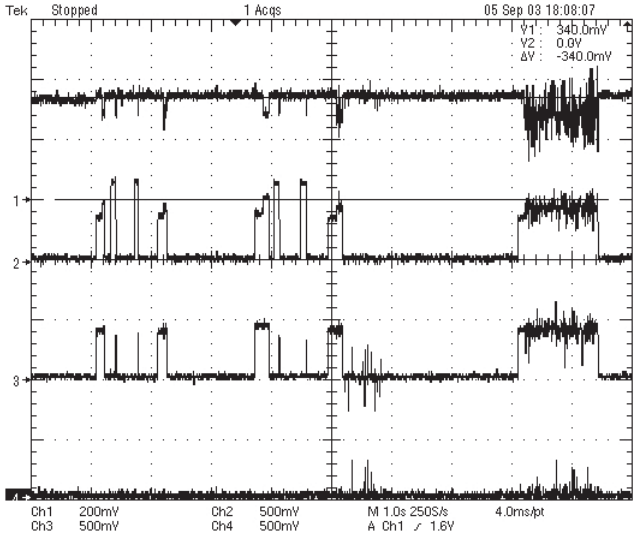
VRDC(LCN201 PIN 34)

VWDC(LCN201 PIN 36)

VWDC2(LCN201 PIN 35)

OPCTRG(LIC301 PIN 151)

33. Laser Power(Erase) _ DVD+RW



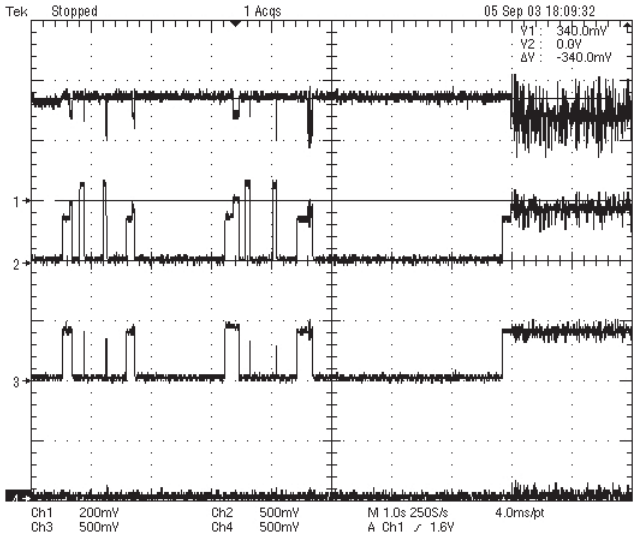
VRDC(LCN201 PIN 34)

VWDC(LCN201 PIN 36)

VWDC2(LCN201 PIN 35)

OPCTRG(LIC301 PIN 151)

34. Laser Power(Writing) _ initial state



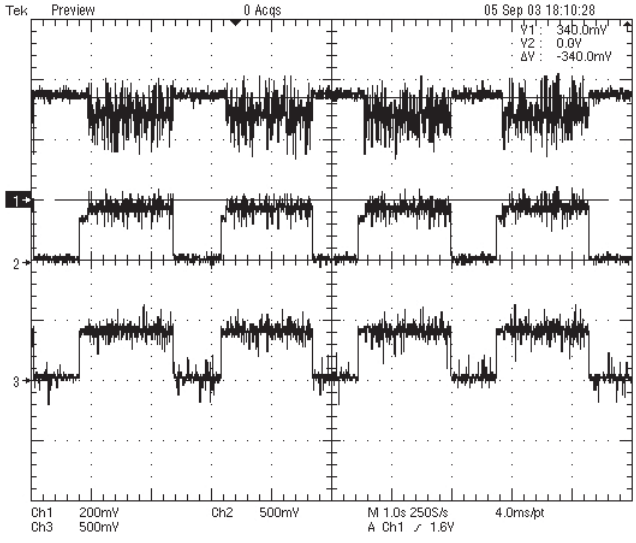
VRDC(LCN201 PIN 34)

VWDC(LCN201 PIN 36)

VWDC2(LCN102 PIN 35)

OPCTRG(LIC301 PIN 151)

35.Laser Power(Writing)_Processing



VRDC(LCN201 PIN 34)

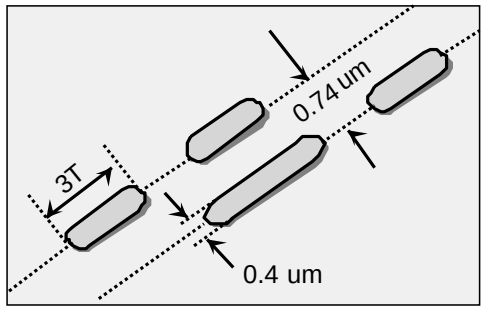
VWDC(LCN201 PIN 36)

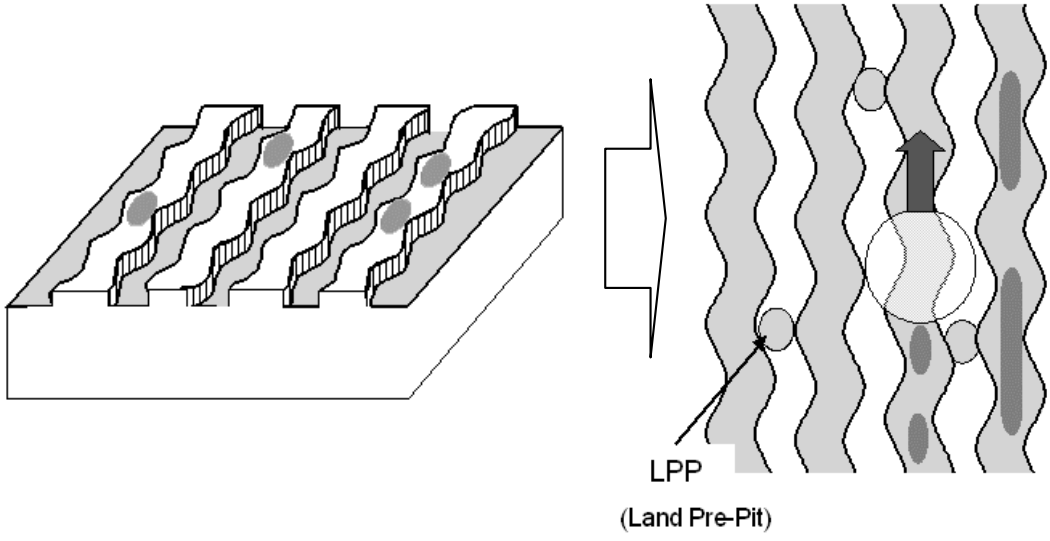
VWDC2(LCN201 PIN 35)

The difference of DVD-R/RW, DVD+R/RW discs and DVD-ROM

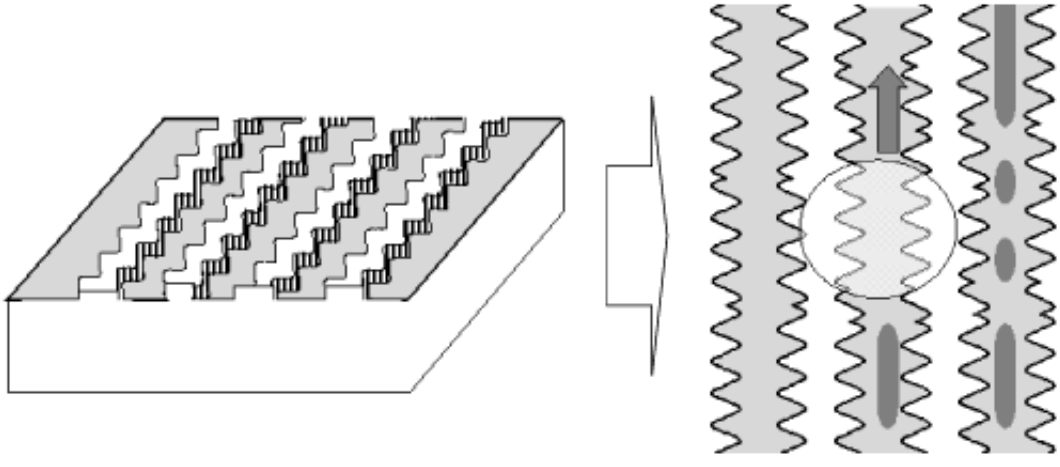
1. Recording Layer

- **DVD-ROM (Read Only Disc)**





- **DVD+R/RW Disc**



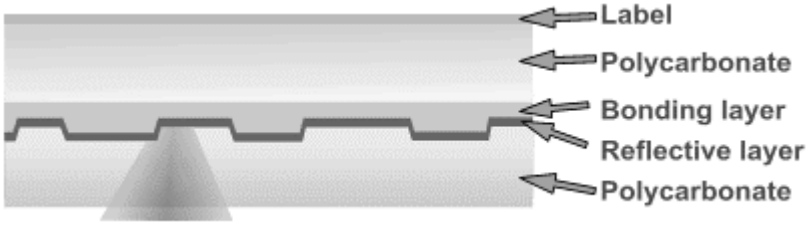
2. Disc Specification

	DVD-ROM		DVD-R	DVD-RW	DVD+R	DVD+RW
	Single-Layer	Dual-Layer				
Media Type	Read Only	Read Only	Dye	Phase change	Dye	Phase change
User data capacity	4.7GB	8.54GB	4.7GB	4.7GB	4.7GB	4.7GB
Wavelength	650nm	650nm	650nm	650nm	650nm	650nm
Reflectivity	45~85%	18~30nm	45~85%	18~30%	45~85%	18~30nm
Track pitch	0.74μm	0.74μm	0.74μm	0.74μm	0.74μm	0.74μm
Minimum pit length	0.4μm	0.4μm	0.4μm	0.4μm	0.4μm	0.4μm
Modulation	>0.6	>0.6	>0.6	>0.6	>0.6	>0.6
Channel bit-rate	26.16MHz	26.16MHz	26.16MHz	26.16MHz	26.16MHz	26.16MHz
Wobble Frequency	–	–	140KHz	140KHz	817.4KHz	817.4KHz
Addressing	26.16MHz	26.16MHz	Wobble & LPP	Wobble & LPP	Wobble(ADIP)	Wobble(ADIP)
Read Power (mW)					0.7 ± 0.1	0.7 ± 0.1
Write Power (mW)	–					
JItter	<8%	<8%	<8%	<8%	<9%	<9%

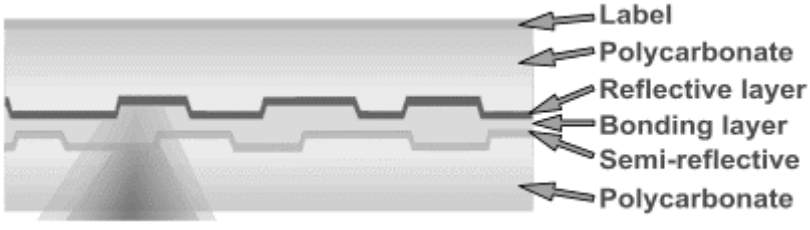
3. Disc Materials

1) DVD-ROM

< Single Layer >



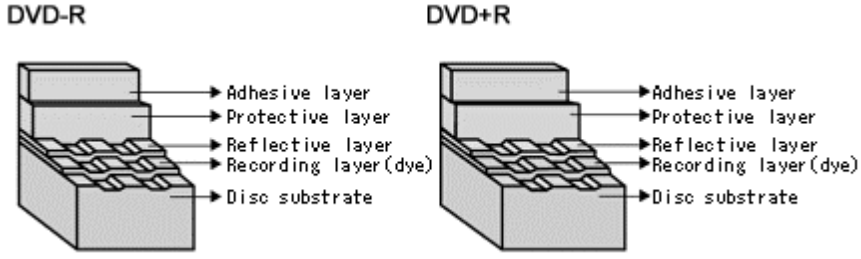
< Dual Layer >



2) Recording format using organic dye material (DVD-R / DVD+R)

The format that records data through the creation of recorded marks by changing the organic dye material with a laser beam.

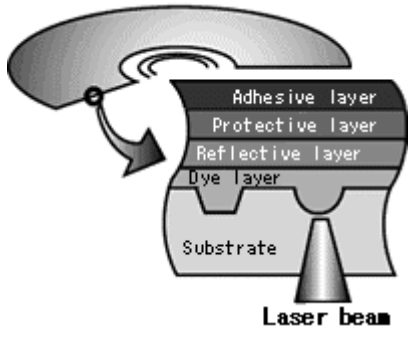
► Disc structure



► Recording principles

[Recording]
Recording is done by changing the organic dye layer and the substrate with a laser When a strong laser is applied to a disc, the temperature of the organic dye material goes up, the dye is decomposed and the substrate changes at the same time. At this time, a durable bit is created as is the case with a CD-ROM.

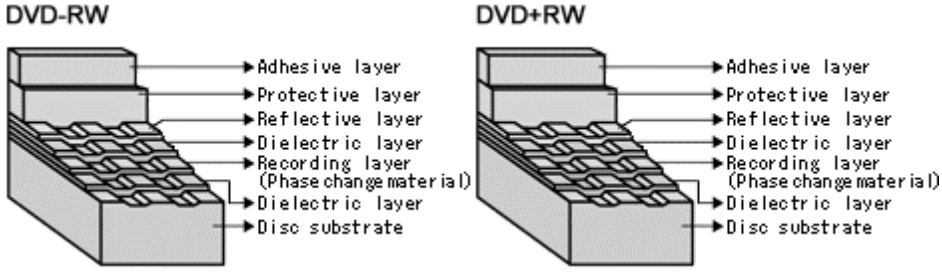
[Playback]
Signals are read with the differences of the reflection of a laser from pits.



3) Recording format using phase-change recording material (DVD-RW / DVD+RW)

- Data is recorded by changing the recording layer from the amorphous status to the crystalline status, and played back by reading the difference of the reflection coefficient.
  Amorphous: Non-crystalline.

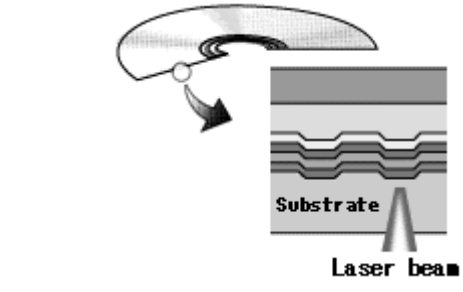
► Disc structure

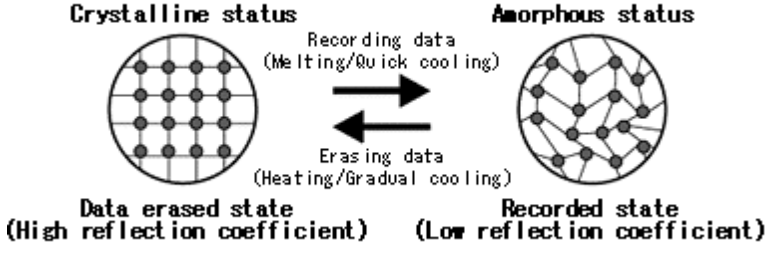


► Recording principles

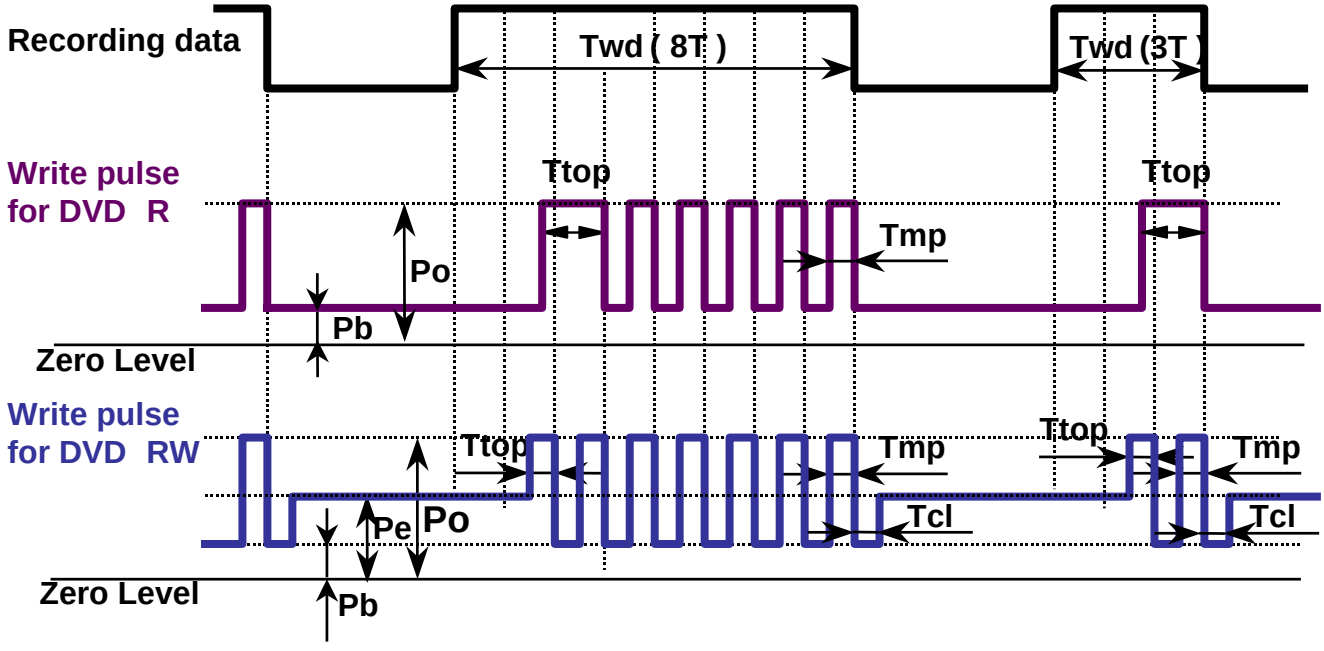
[Recording]
When a high-power laser is applied to the recording material, it melts and then becomes amorphous with a low reflection coefficient when it quickly cools off. When a mid-power laser is applied to heat gradually the recording material and then gradually cools it off, it becomes crystal with a high reflection coefficient.

[Playback]
A low-power laser is used for playback. The amount of reflected light depends on the status (amorphous or crystalline) of the recording material. This is detected by an optical sensor.





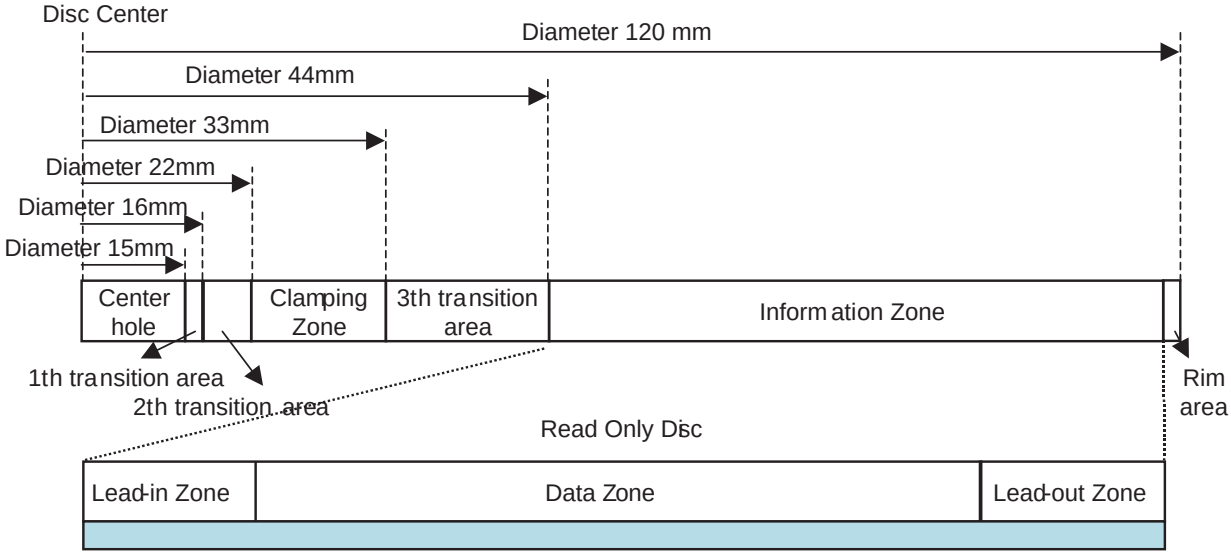
To make recordings, it is necessary to modulate the write pulse, which is called “Write Strategy”.
There can be many types in Write Strategy. Typically Write Strategy for DVD ±R has NMP(Non Multi-Pulse) type and MP(Multi-Pulse) type. In NMP type each single mark is created by subsequent separated short pulses. In MP type each single mark is created by one continuous pulse.
Write Strategy for DVD ±RW has Type 1 and Type2. In Type 1 the mark with nT width is created by one top pulse and (n-2) multi-pulses. Thus mark 3T is made by one top pulse and one multi-pulse. In Type 2 the mark with nT width is created by one top pulse and (n-3) multi-pulses. Thus mark 3T is made by one top pulse only.
RL-02A uses MP type Write Strategy for DVD ±R and Type 1 for DVD ±RW as shown below.



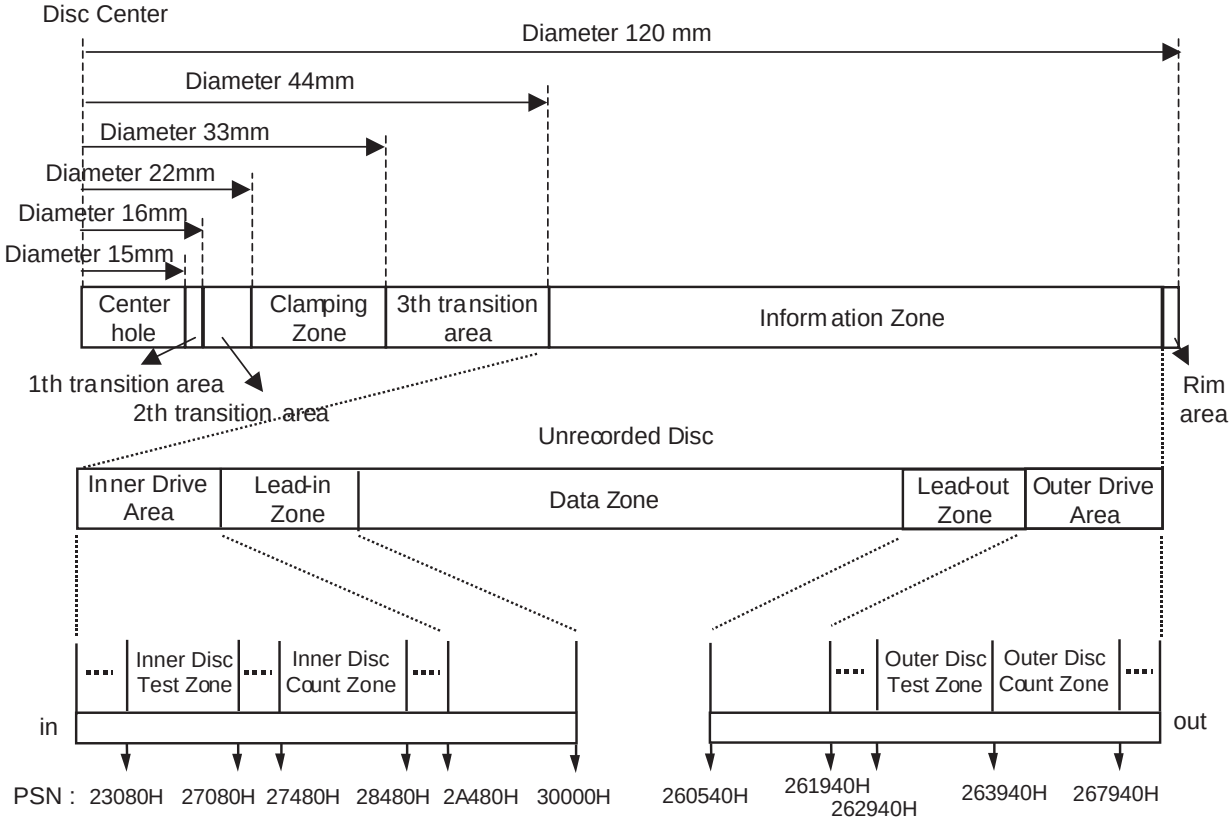
Po :Write Power (Peak Power)
Pe :Erase Power
Pb :Bias Power

4. Organization of the Inner Drive Area, Outer Drive Area, Lead-in Zone and Lead-out Zone

1) Layout of DVD-ROM disc

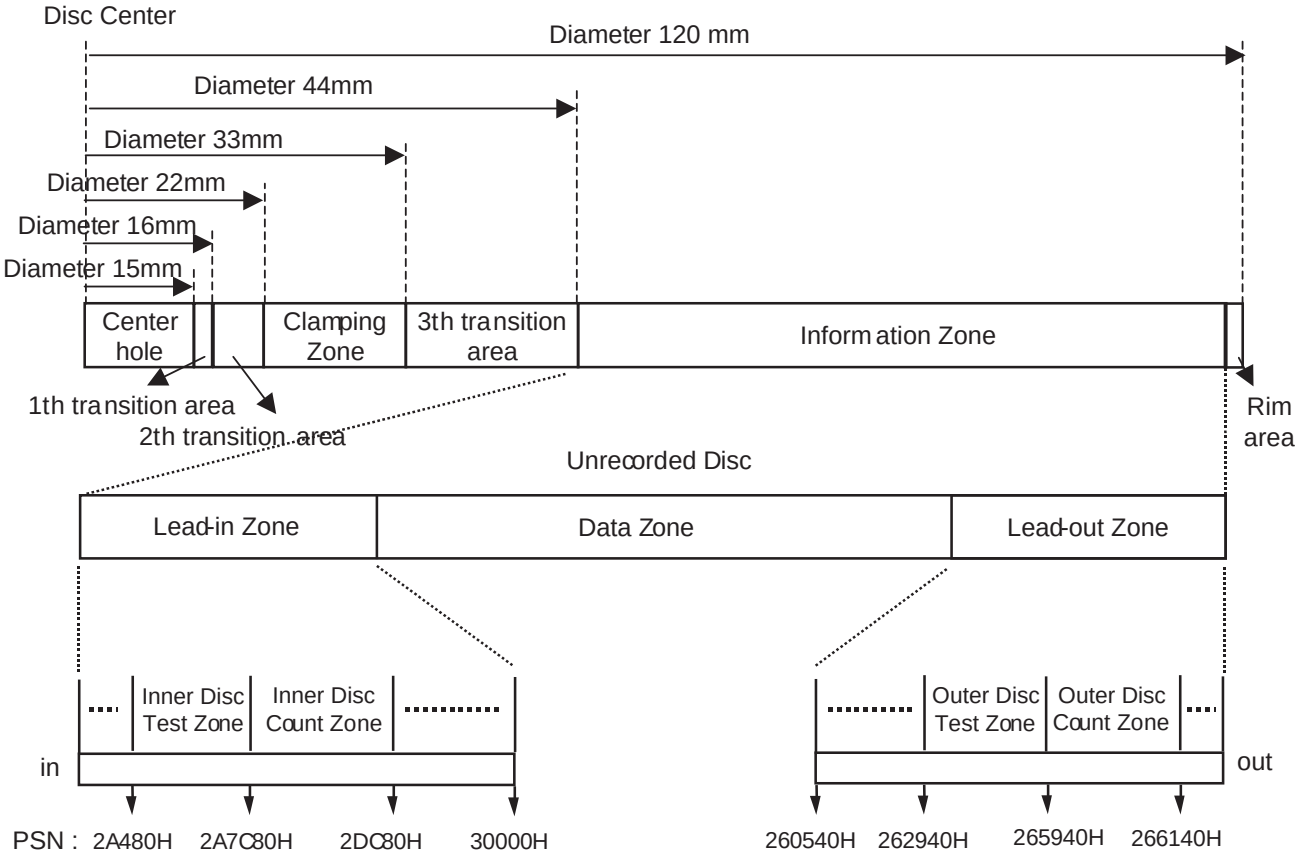


2) Layout of DVD+R disc



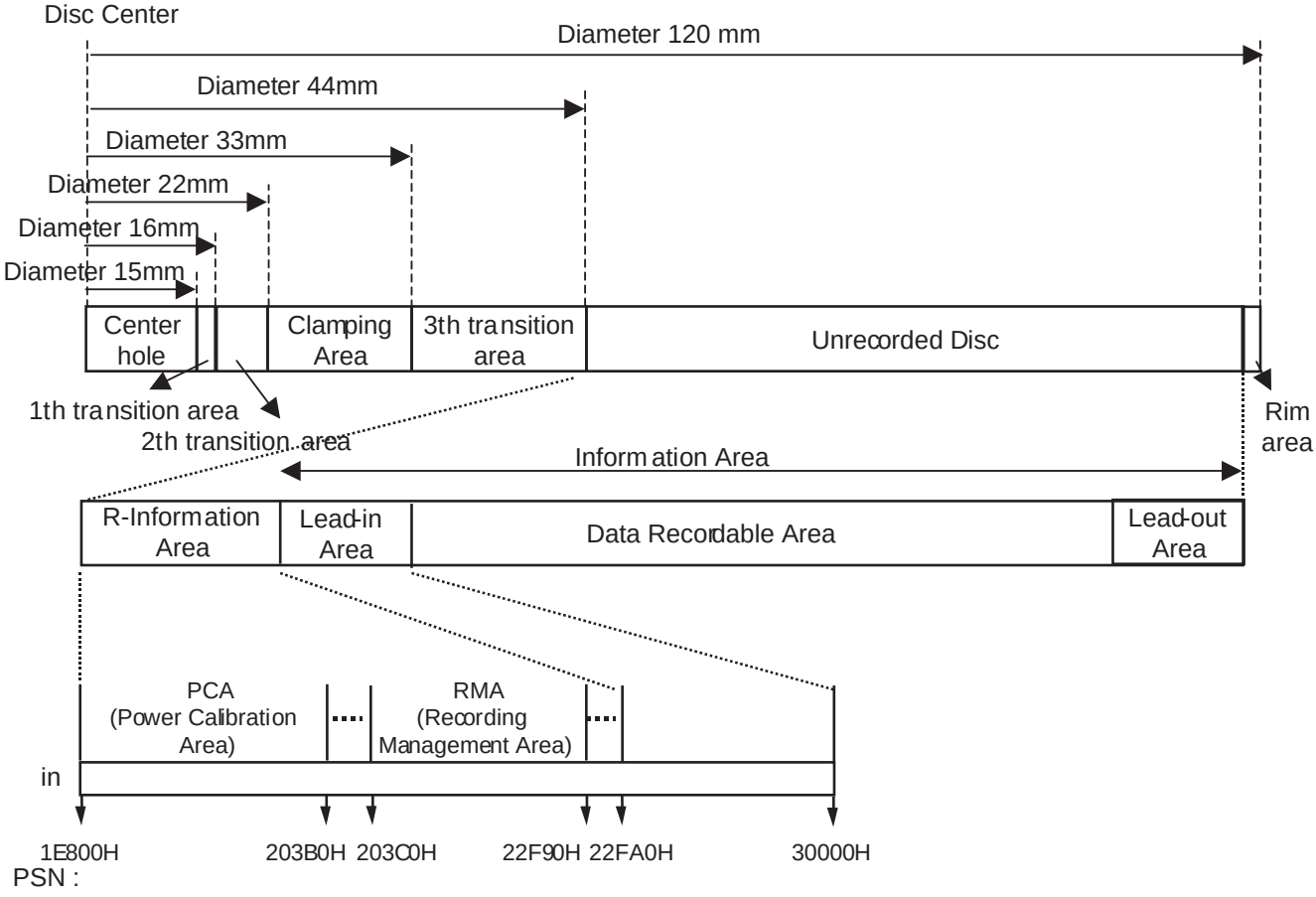
Inner Disc Test Zone : for performing OPC procedures.
Inner Disc Count Zone : For counting the number of OPC algorithm performed in IDT Zone.
Outer Disc Test Zone : for performing OPC procedures.
Outer Disc Count Zone : For counting the number of OPC algorithm performed in IDT Zone.

3) Layout of DVD+RW disc



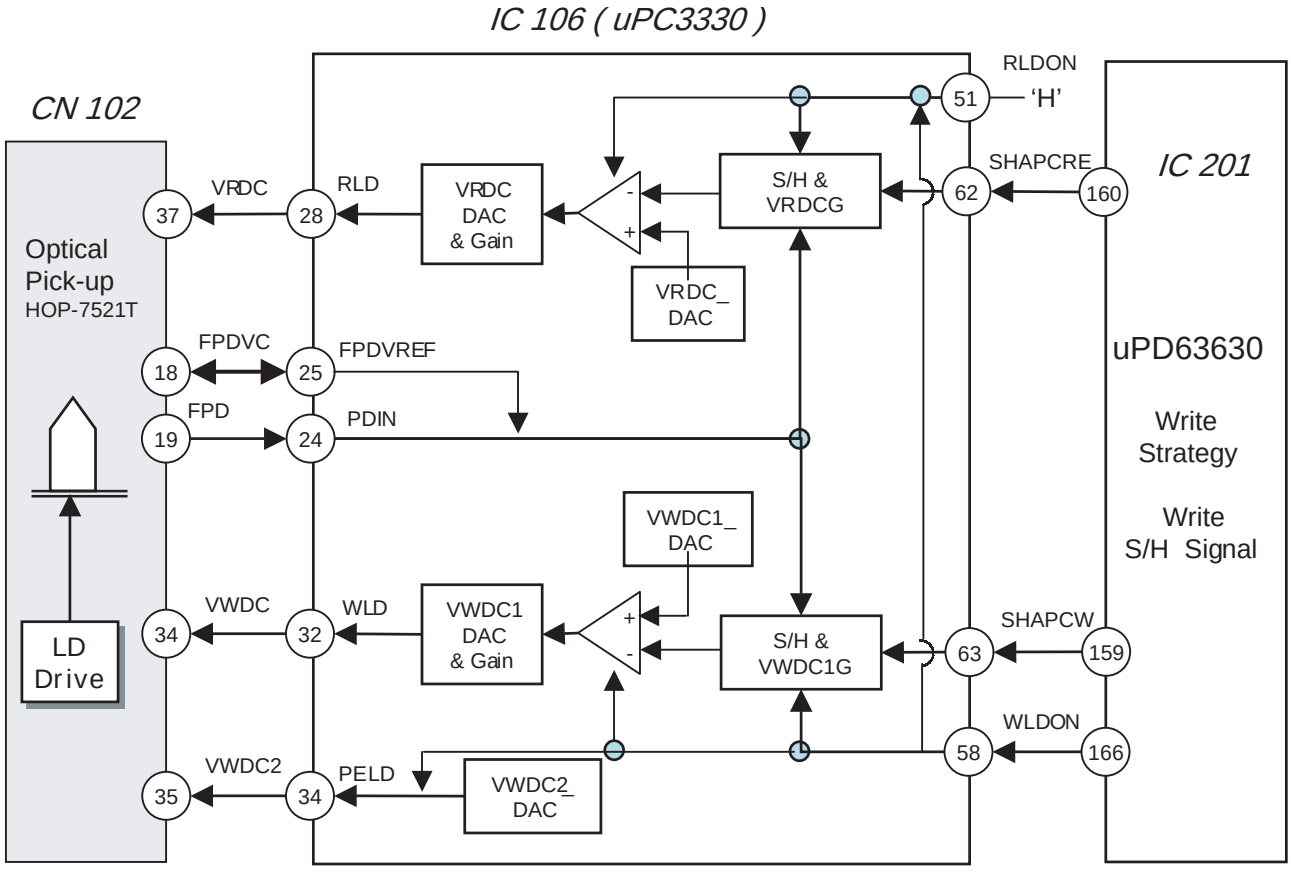
Inner Disc Test Zone : for performing OPC procedures.
Inner Disc Count Zone : For counting the number of OPC algorithm performed in IDT Zone.
Outer Disc Test Zone : for performing OPC procedures.
Outer Disc Count Zone : For counting the number of OPC algorithm performed in IDT Zone.

4) Layout of DVD-R/RW disc



5. ALPC(Automatic Laser Power Control) Circuit

1) Block Diagram



2) ALPC(Automatic Laser Power Control) Circuit Operation

ALPC function in CD-R/RW,DVD+R/RW analog front-end is for constant power level control purpose.
Based on the accurate power sensor(FPD) in OPU, ALPC feedback loop maintains constant power level against laser diode's temperature variation.
There are two power control loops in uPC3330, which are used with different combination for different applications. Generally, the first ALPC loop is used for read-power control. The 2nd ALPC loop is used for write(erase) power control for CD-R/RW and DVD+R/RW disc.
Owing to the small signal level in read-power control mode, the first ALPC loop amplifies the FPD signal to enhance the accuracy of read power control. The built-in 10-bit DAC(VRDC_DAC) is used to set the read power level.
Moreover, the 2nd ALPC loop is used for high power control. The built-in 10-bit DAC(VWDC1_DAC) is used to set the wanted power level.
And the register VWDC1G is employed to adjust the gain of FPD signal.
The following potentiometers(VRDC_DAC, VWDC1_DAC, and VWDC2_DAC) and amplifiers (VRDCG and VWDC1G) are used to set the wanted levels of the output pins RLD, WLD, and PELD

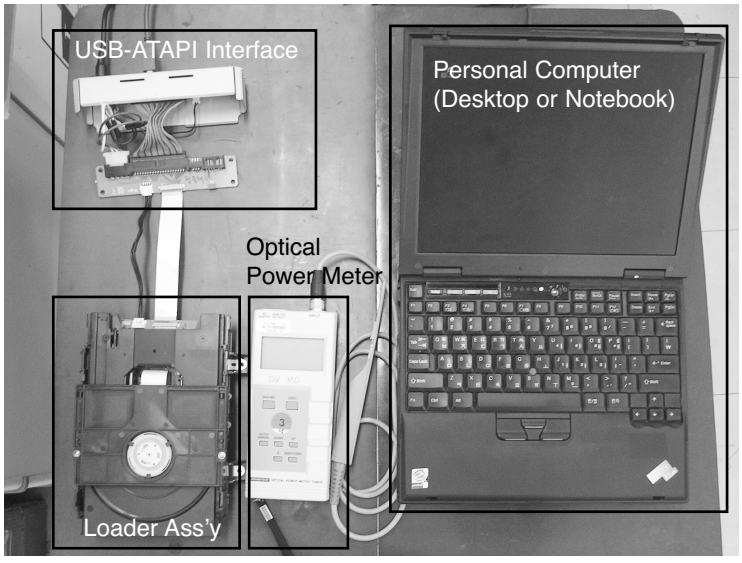
How to use test tool

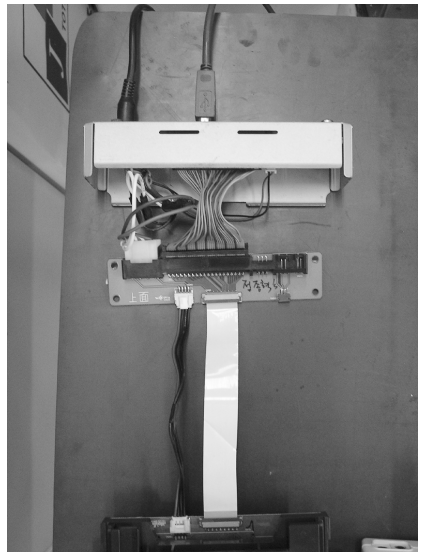
1. ALPC Measurement System Configuration

In order to measure and adjust DVD RW optical power, The following measurement equipments are needed.

- Compulsory equipment
  - ① Optical Power meter & Sensor (ADVANTEST, TQ8210/Q82017A or equivalent
  - ② Personal Computer (Pentium 3, 500MHz Above, , RAM:64M Above, Win98 Above)
  - ③ Adjustment Program (Dragon or ALPC) for SVC, ALPC Program recommended

- FI optional equipment
  - ①USB-ATAPI Interface (needed when using USB Port from the laptop computer without ATAPI interface or a desktop computer)
  - ②Connector-ATAPI Interface Board(Part Mo:6881R-7677A) (needed when ATAPI is not attached to Loader)





Connector-ATAPI Interface Board

2. ALPC Program Configuration

ALPC Program consists of total 4 files.

ALPC.exe
LgBada.dll
modelnm.txt
WNASPI32.DLL

These 4 files should be located in one directory.
ALPC.exe is a program execution file.
modelmn.txt is a configuration file.

Determine how to connect

The following contents are included when you open "modelnm.txt" file.

The following contents are included when you open LGE connect=0

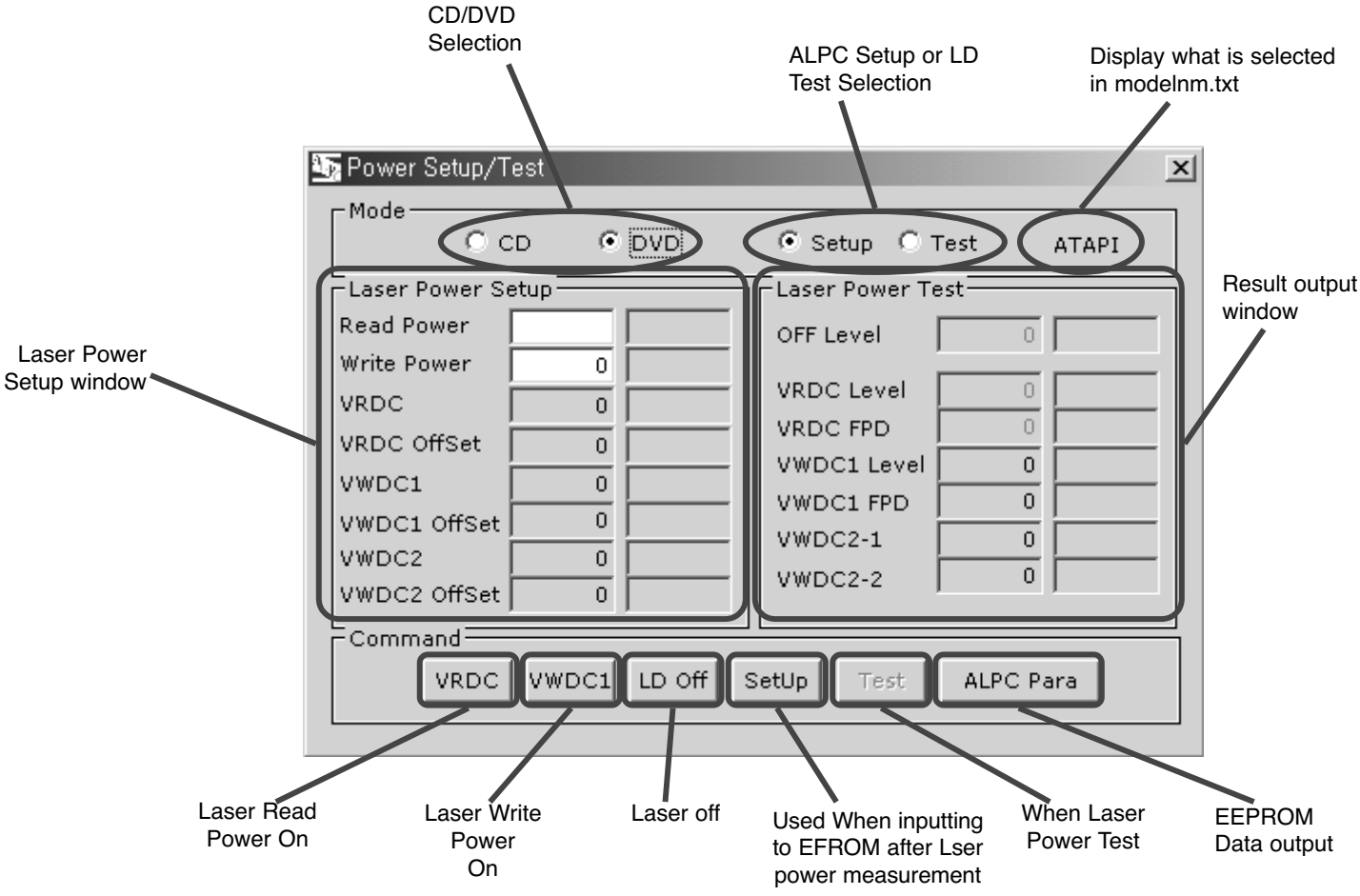
connect=0 is the item which you can determine whether you use Serial or ATAPI.

0 : ATAPI
1 : Serial

Thus, select connect=0 to use ATAPI, or select connect=1 to use Serial, then save the file.
(For SVC, ATAPI setting is recommended.)

3. Running ALPC Program

When running ALPC.exe file, the following screen appears.



4 LD Test

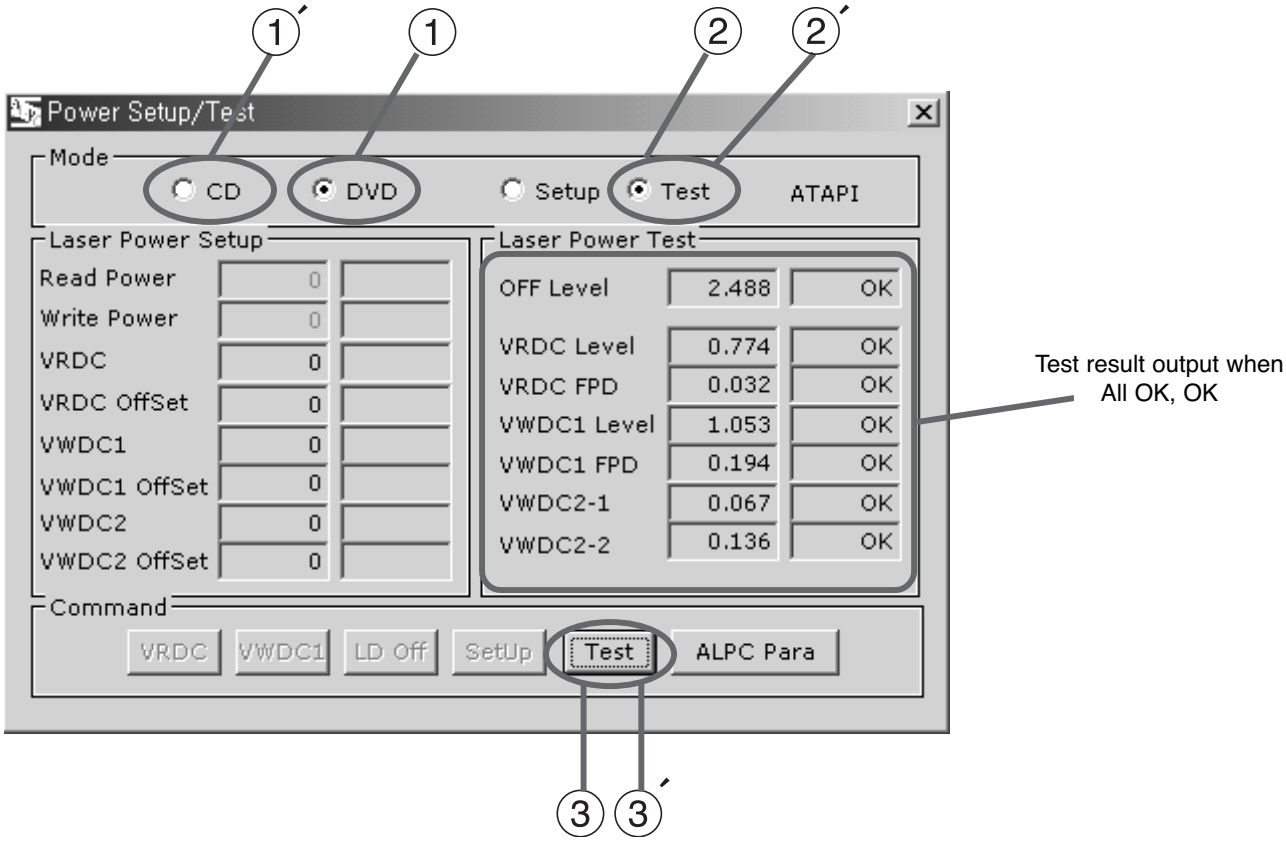
*** Test DVD LD**

① Select DVD mode
② Select Test mode
③ Click Test

*** Test DVD CD**

① Select CD mode
② Select Test mode
③ Click Test

Section	Off	VRDC	VR_FPD	VWDC1	VW_FPD	VW2-1	VW2-2
CD	2.4±0.08	0.53±0.22	0.02±0.01				
DVD	2.4±0.08	0.7±0.2	0.04±0.01	0.43±0.05	0.2±0.02	0.08±0.02	0.2±0.03



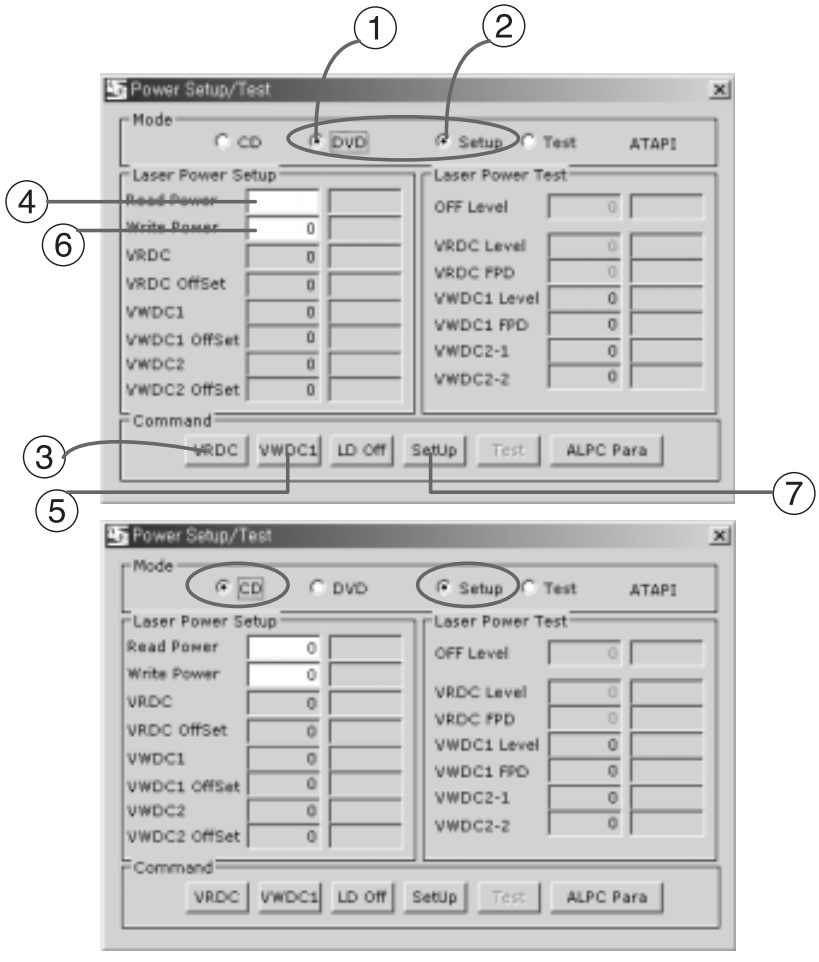
Specification can be changed according to pick-up type, circuit, program, and chipset.
If specifiction is changed, program can be sent by supervisor.
Specification above is temporary reference.

5. Optical Power Setting

When replacing Travers ass'y including Pick-up or Loader PCB, Optical Power Setting should be performed for Pick-up and Loading PCB's matching.

① DVD LD optocal Power Setting
- Select DVD and Setup mode
- Push VRDC. (Read Power On. Strong Red light can be seen from pick up optical lens.)
- Measure optical power.
- Write measurement value in Read Power.
- Push VWDC1. (Write power On.) (Caution) Light is very strong. Never look at the light directly.
- Measure optical power
- Write measurement value in Read Power and push LD off LD Off.
- Push SetUp. (Measurement value is inputted to EEPROM)

② DVD LD optocal Power Setting
- Select CD and Setup mode
- Push VRDC. (Read Power On. Weak Red light can be seen from pick up optical lens.)
- Measure optical power.
- Write measurement value in Read Power.
- Push VWDC1. (Write power On. Weak Red light can be seen.)
- Measure optical power and push LD off LD Off.
- Write measurement value in Read Power.
- Push SetUp. (Measurement value is inputted to EEPROM)



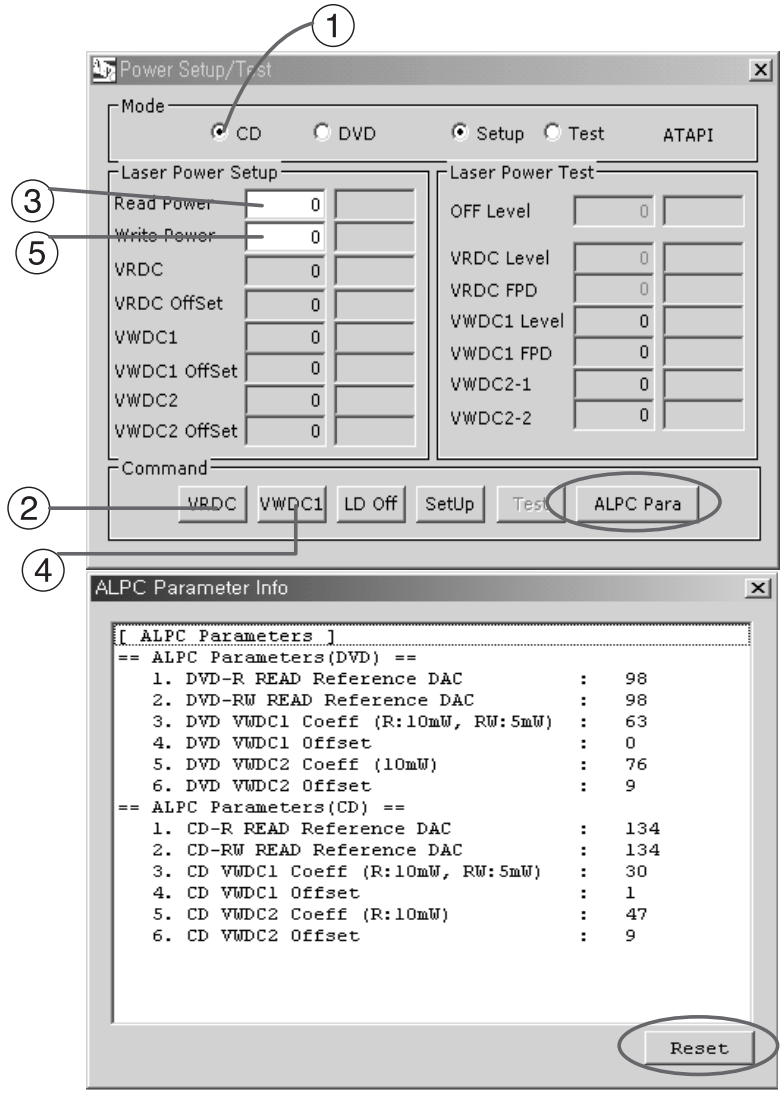
6. Optical Power Setting Parameter Check

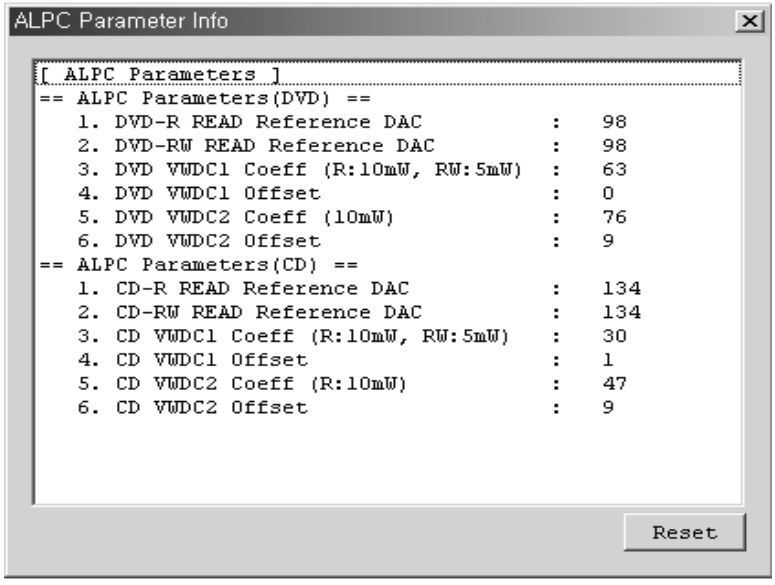
Use when defective happens even though LD test result is normal.

When defective can be found but power test result is OK, You need to check current settings whether they are proper or not. In this case, Pressing ALPC Para will display ALPC Parameter Info window and show current optical power settings recorded in EEPROM(IC302).

Write down these settings on the paper, perform optical power setting and press ALPC Para again, then new optical power settings will appear. Compare these two parameters. If there is a big difference, optical power setting may have been wrong at first or pick-up optical output may have been changed. If pick-up is normal, problem can be solved by resetting optical power without replacing pick-up.

In order to remove previous ALPC Parameter from ALPC Parameter Info, press Reset at the bottom of ALPC Parameter Info window.





[VALID ALPC Parameters]

<CD>

1) CD-R READ Reference DAC : 70 ~ 100
2) CD-RW READ Reference DAC : 70 ~ 100

<DVD>

1) DVD-R READ Reference DAC : 42 ~ 107
2) DVD-RW READ Reference DAC : 42 ~ 107
3) VWDC1 : 35 ~ 65
4) VWDC1 Offset : 0 ~ 6
5) VWDC2 : 20 ~ 43
6) VWDC2 Offset : 0 ~ 10

Appendix. How to measure optical power

Optical power measurement is measuring actual optical power coming out from an object lens with LD turned on.
thus, In order to measure optical power, LD should to be turned on and environment need to be dark enough.
If necessary, Cover the top side of the sensor with black paper or hand when measuring.
Generally, fluorecent light is about 50 μW, sun light is about 100 mW. so, If this is ignored, optical power setting may not be set correctly.

Optical power mesurement procedure

1. Adjust optical power meter's λ(wave length) to DVD. (Generally 660 nm)

2. Turn DVD LD on.

3. Place sensor less than 3mm apart from pick-up object lens, perpendicular to lens.
   Adjust position so that the center of object lens match to □ mark on the sensor.

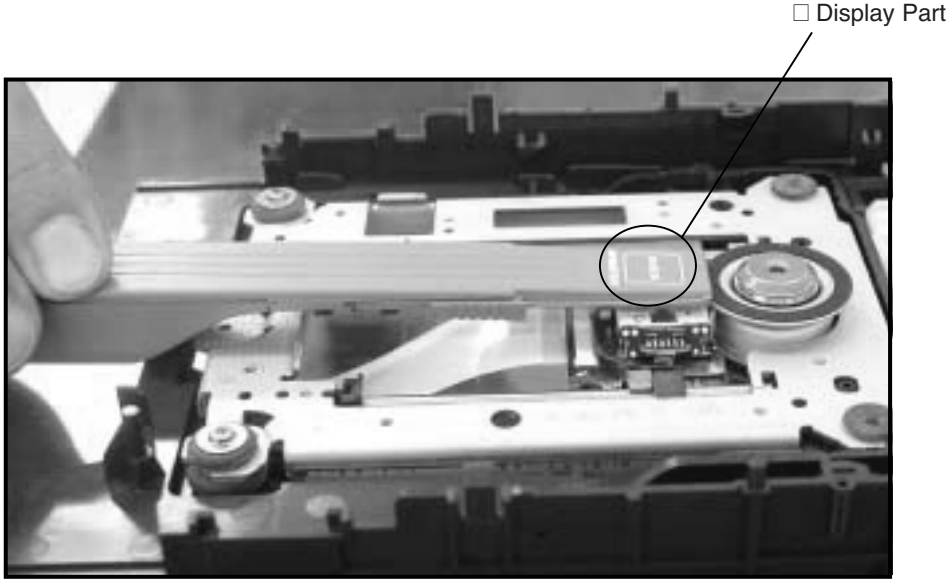
4. Read monitor's value. (Read Maximum value as moving position slightly)
   (Check working unit. Unit should be mW. When LD is dead, μW or nW unit may not be read correctly.)

5. Multiply monitor's value by 100, round off to the nearest integer, then write constant part.

6. Adjust optical power meter's λ (wave length) to CD. (Generally 780 nm)

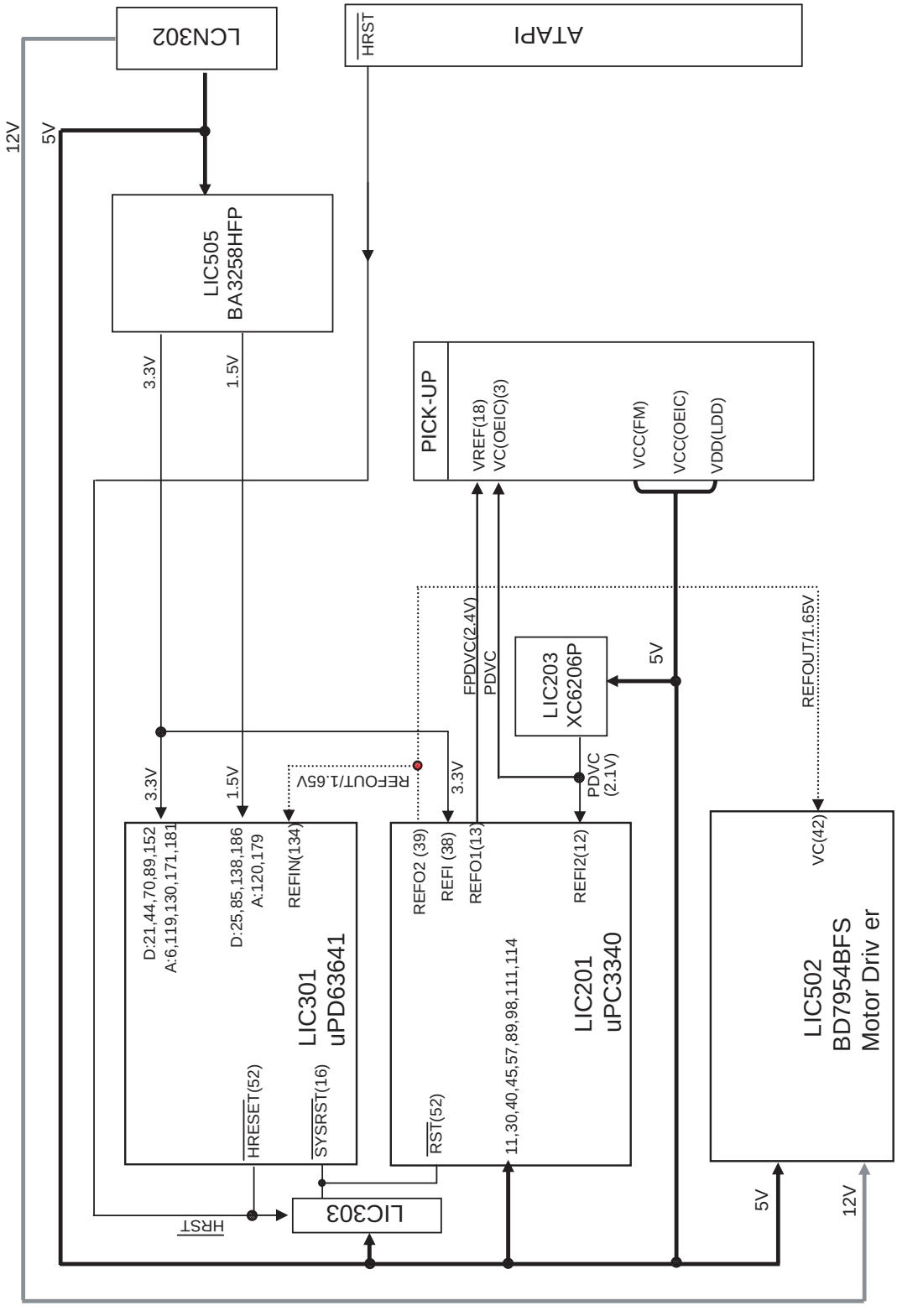
7. Turn CD LD on.

8. Repeat step 3~5 above.

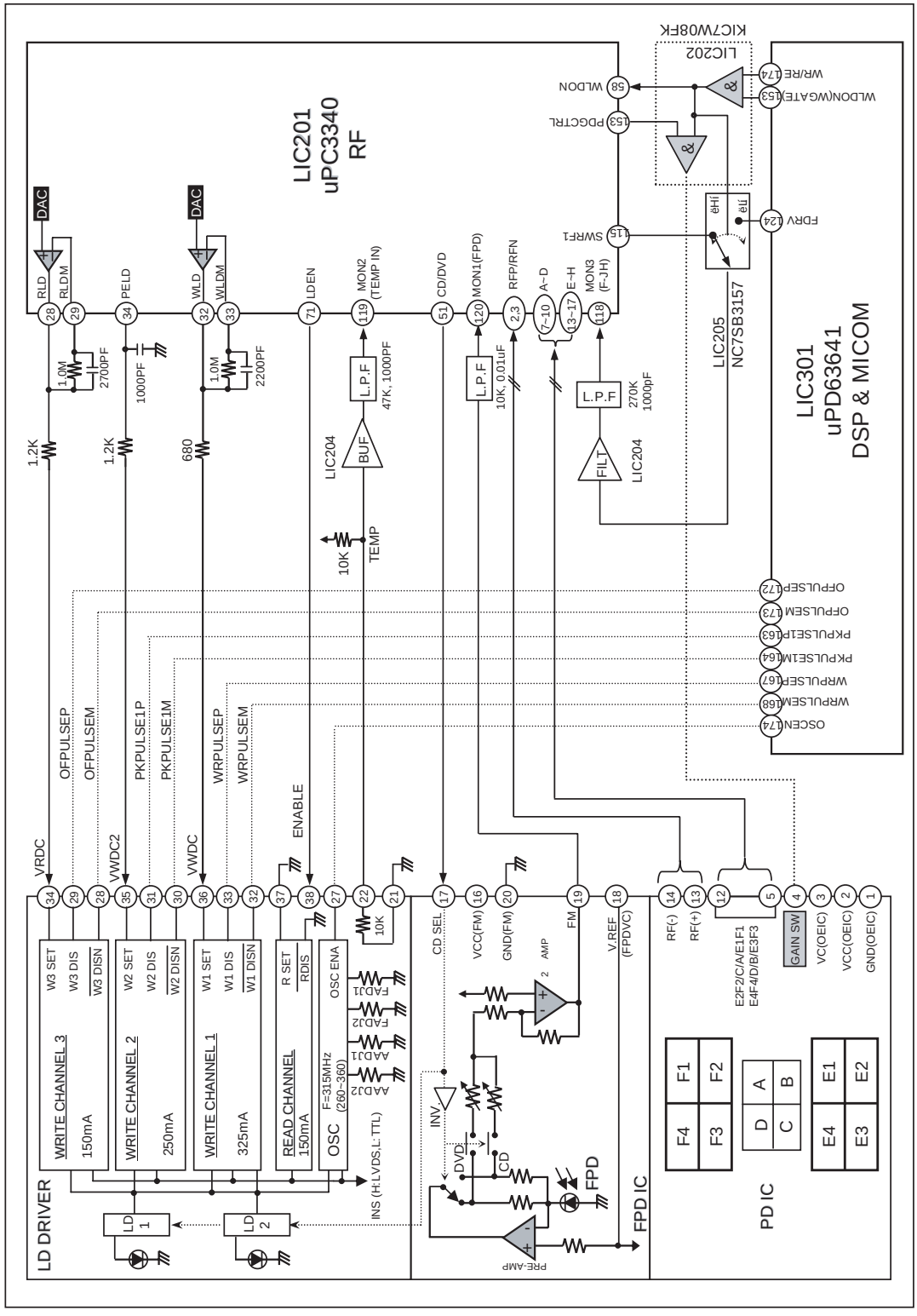


BLOCK DIAGRAMS

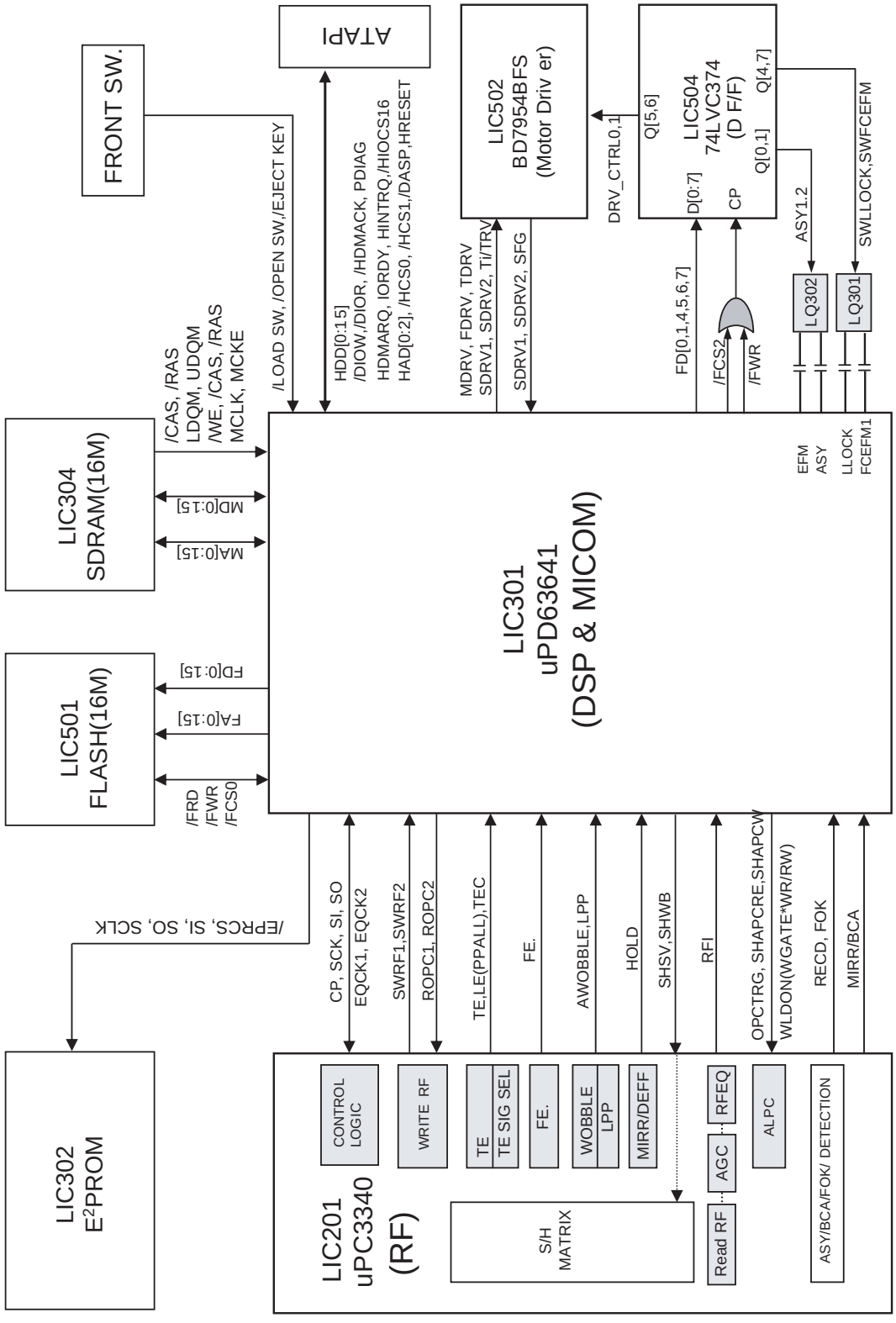
1. OVERALL BLOCK DIAGRAM



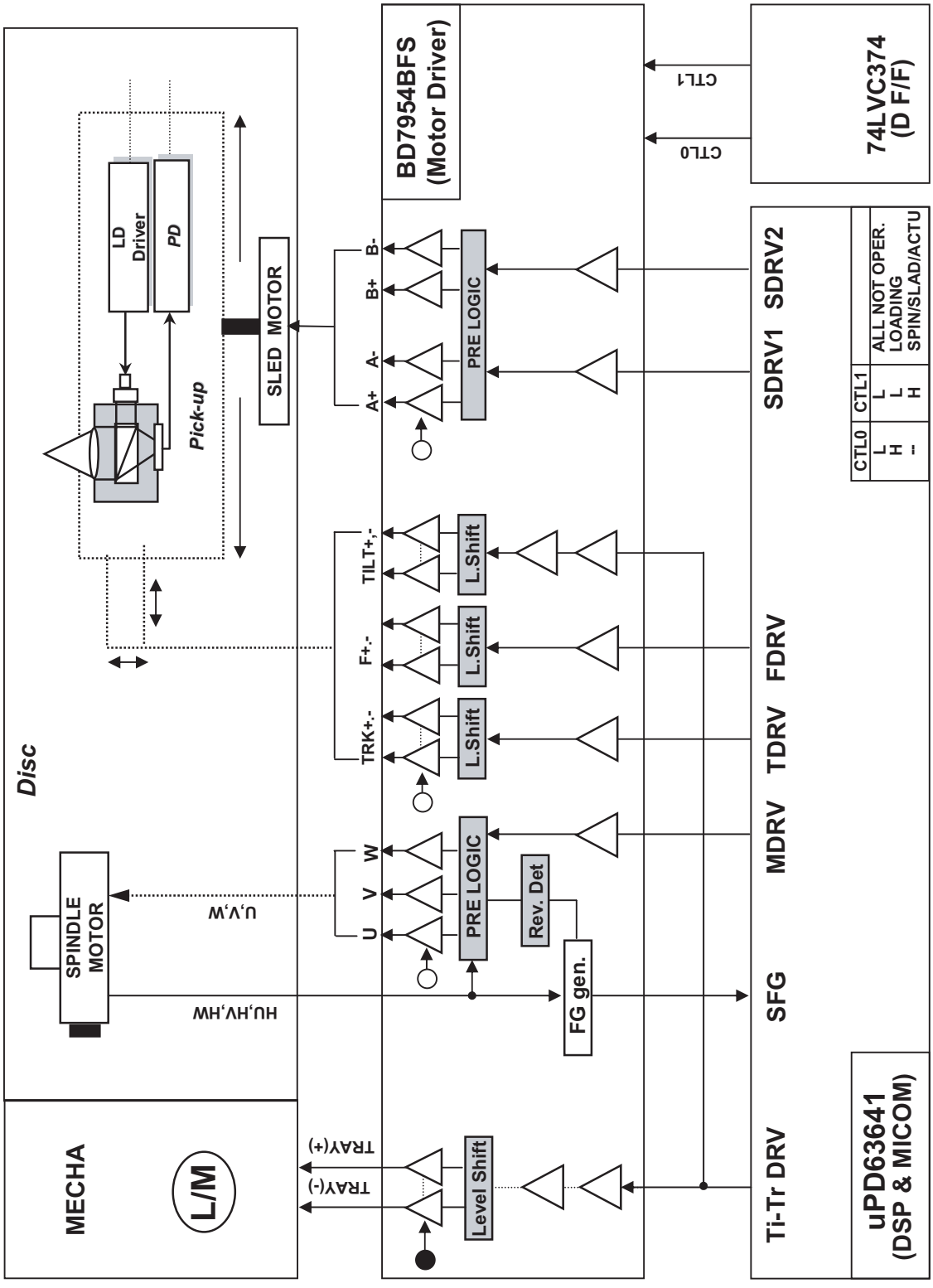
2. DSP BLOCK DIAGRAM



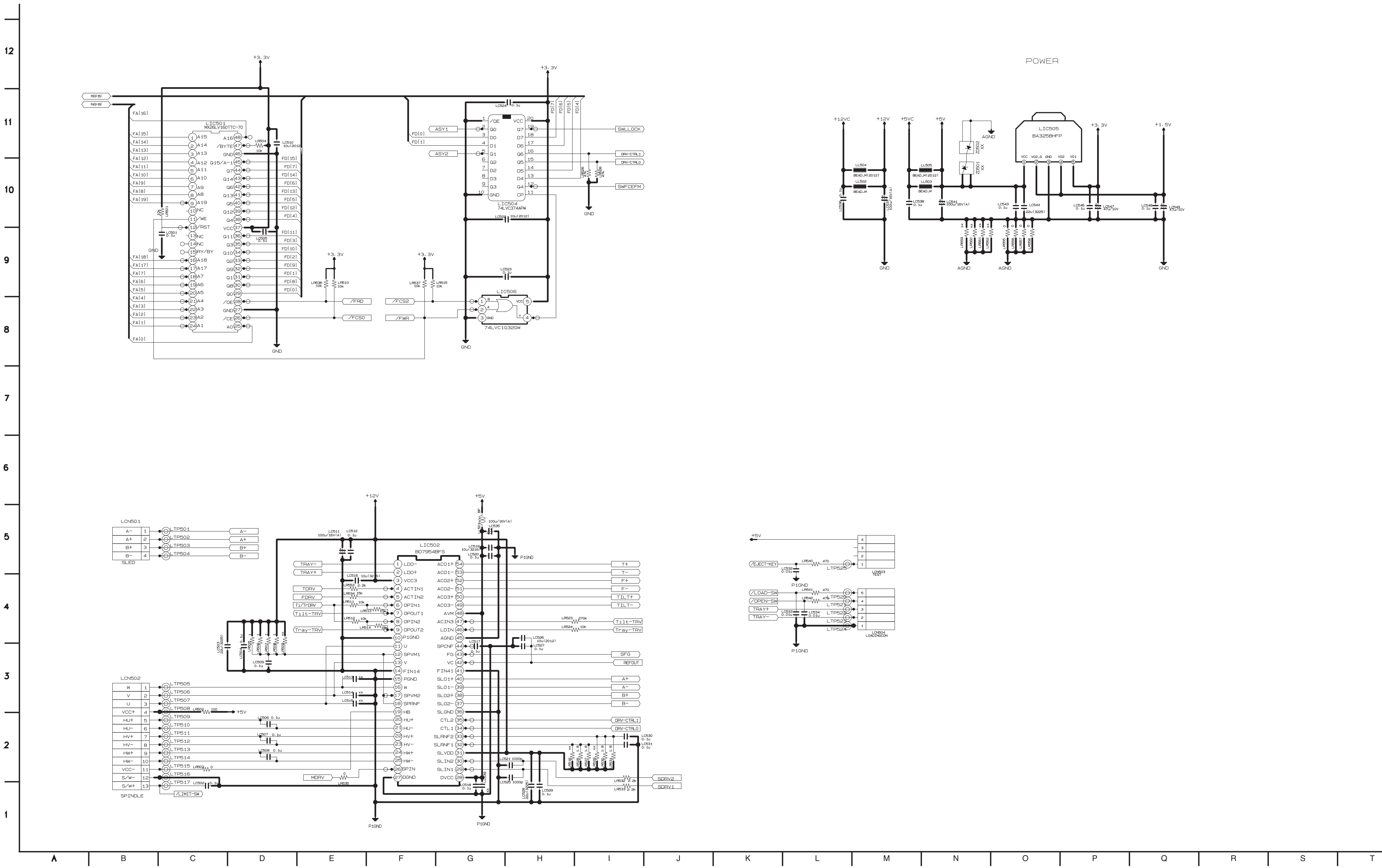
3. μ-COM BLOCK DIAGRAM



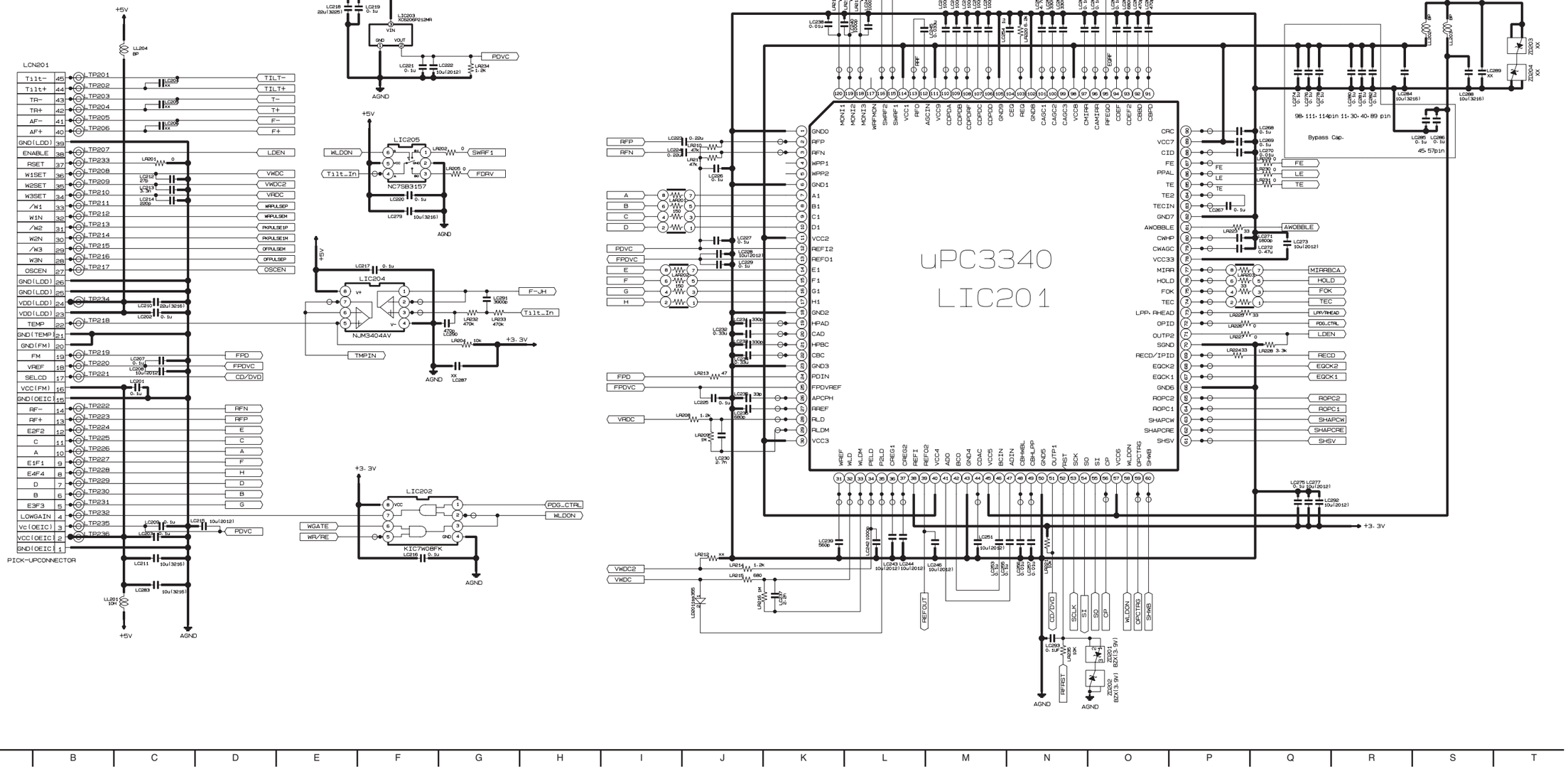
4. RF BLOCK DIAGRAM



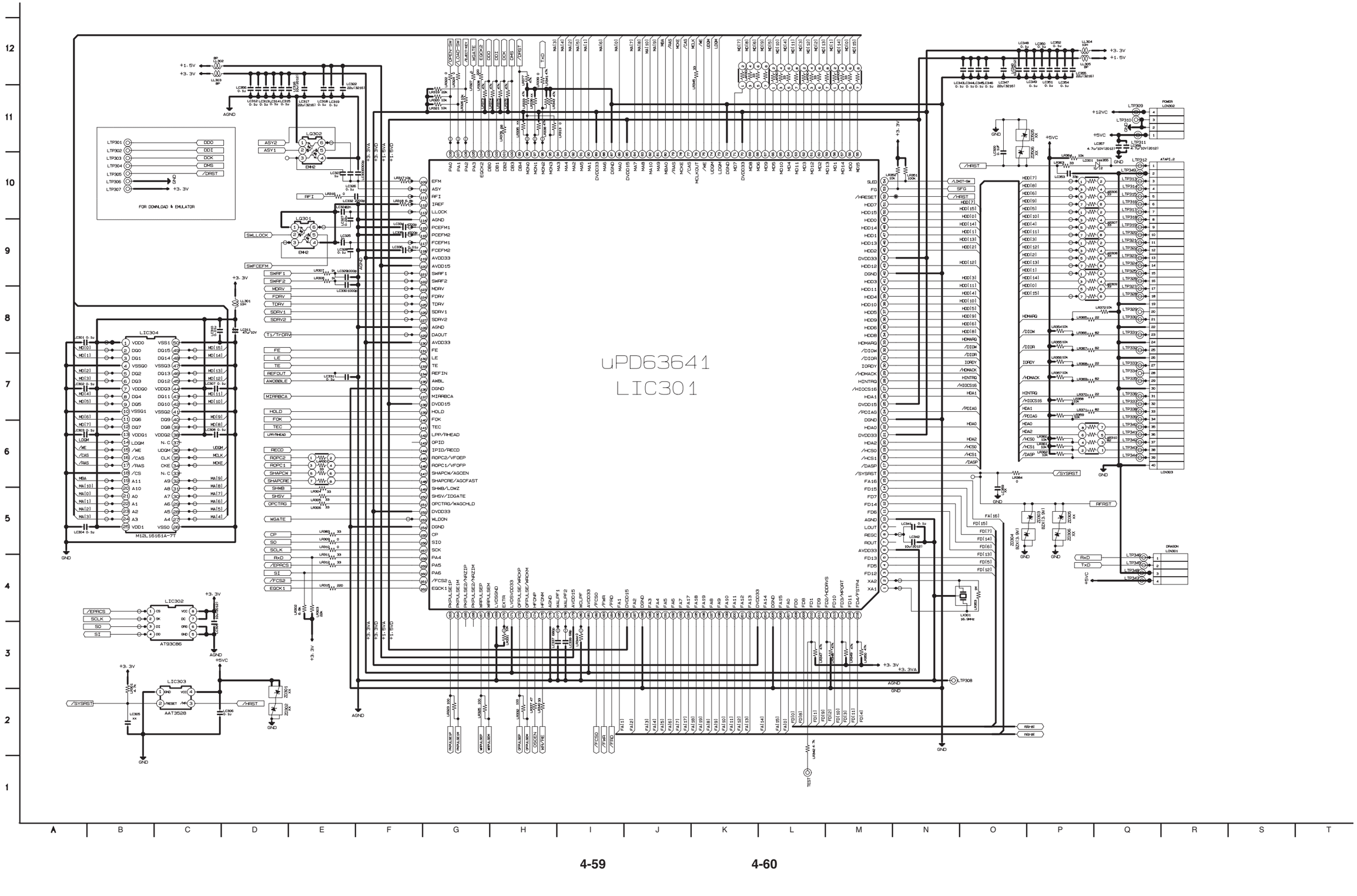
CIRCUIT DIAGRAMS
1. RF CIRCUIT DIAGRAM



2. DSP CIRCUIT DIAGRAM



3. μ-COM CIRCUIT DIAGRAM



CIRCUIT VOLTAGE CHART

MODE / PIN NO.	STATE
LIC201	
1	0
2	2.35
3	2.35
4	2.36
5	2.36
6	0
7	2.14
8	2.14
9	2.14
10	2.14
11	5.07
12	2.13
13	2.38
14	2.14
15	2.14
16	2.14
17	2.14
18	0
19	2.39
20	0.11
21	2.38
22	0.11
23	0
24	2.38
25	2.38
26	1.71
27	0
28	0
29	0
30	5.06
31	0
32	0
33	0
34	0
35	0
36	2.52
37	2
38	3.34
39	1.68
40	5.07
41	1.57
42	1.61
43	0
44	1.26
45	5.07
46	2.36
47	2.36
48	2.41
49	2.43
50	0
51	0
52	3.34
53	3.34
54	3.34

MODE / PIN NO.	STATE
55	0
56	3.34
57	5.08
58	0
59	0
60	3.34
61	3.34
62	3.34
63	0
64	0
65	0
66	0
67	1.67
68	1.63
69	0
70	0
71	0
72	0
73	0
74	0
75	3.33
76	3.33
77	0
78	3.33
79	1.82
80	2.37
81	1.89
82	0
83	2.36
84	1.66
85	1.68
86	1.61
87	1.69
88	2.6
89	5.07
90	0
91	3.17
92	3.17
93	1.29
94	1.87
95	1.75
96	1.81
97	1.83
98	5.07
99	0
100	0
101	0
102	0
103	1.14
104	1.81
105	0
106	3.93
107	3.93
108	3.93
109	3.93

MODE / PIN NO.	STATE
110	3.93
111	5.07
112	2.9
113	1.64
114	5.07
115	0
116	0
117	0
118	1.65
119	1.3
120	2.38
LIC202	
1	3.33
2	0
3	0
4	0
5	0
6	0
7	0
8	3.34
LIC203	
1	0
2	2.13
3	5.08
LIC204	
1	1.7
2	1.69
3	1.55
4	0
5	0
6	1.35
7	1.35
8	5.08
LIC205	
1	1.97
2	0
3	1.68
4	1.68
5	5.07
6	0
LIC301	
1	1.61
2	1.45
3	1.42
4	0
5	0
6	3.34
7	3.34
8	0
9	0
10	0
11	0
12	0
13	0
14	0

MODE / PIN NO.	STATE
15	0
16	3.34
17	5.19
18	3.42
19	3.43
20	0
21	3.34
22	0
23	0
24	5.04
25	1.51
26	0
27	5.08
28	0
29	3.43
30	5.07
31	3.43
32	3.43
33	3.35
34	3.32
35	3.32
36	3.32
37	3.33
38	3.31
39	3.32
40	3.32
41	3.32
42	0
43	3.32
44	3.34
45	3.32
46	3.32
47	3.32
48	3.32
49	3.32
50	3.32
51	0
52	3.85
53	0
54	3.31
55	0
56	0
57	0
58	0
59	0
60	0
61	0
62	0
63	0
64	0
65	0
66	0
67	0
68	0
69	0

MODE / PIN NO.	STATE
70	3.34
71	0
72	0
73	3.34
74	3.34
75	3.34
76	1.02
77	3.33
78	3.34
79	3.34
80	0
81	0
82	3.34
83	0
84	3.34
85	1.51
86	0
87	0
88	0
89	3.34
90	0
91	0
92	0
93	0
94	0
95	0
96	3.34
97	0
98	0
99	0
100	3.32
101	3.32
102	3.32
103	0
104	1.64
105	0
106	3.33
107	3.34
108	0
109	1.67
110	1.67
111	1.66
112	0.72
113	0
114	0
115	1.66
116	1.66
117	1.84
118	3.34
119	3.29
120	1.51
121	1.01
122	2.29
123	1.67
124	1.68

MODE / PIN NO.	STATE
125	1.68
126	1.67
127	1.67
128	0
129	1.7
130	3.34
131	1.7
132	1.47
133	1.83
134	1.68
135	1.62
136	0
137	2.9
138	1.51
139	0
140	0
141	0
142	0
143	0
144	0
145	0
146	0
147	0
148	3.34
149	3.34
150	3.34
151	0
152	3.32
153	0
154	0
155	3.34
156	0
157	3.34
158	3.34
159	0
160	3.34
161	3.34
162	1.64
163	1.4
164	1.21
165	0
166	1.31
167	2.79
168	1.31
169	0
170	0
171	3.34
172	3.32
173	1.28
174	3.24
175	0
176	0
177	0
178	0
179	1.51

MODE / PIN NO.	STATE
180	0
181	3.34
182	0
183	3.34
184	3.34
185	0
186	1.5
187	0
188	0
189	0
190	0
191	0
192	0
193	0
194	0
195	0
196	0
197	0
198	0
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200	0
201	0
202	0
203	3.34
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205	0
206	0
207	0
208	0
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210	3.33
211	0
212	0
213	0
214	3.33
215	0
216	3.33
LIC302	
1	0
2	3.34
3	0
4	3.34
5	0
6	0
7	0
8	0
LIC303	
1	0
2	3.34
3	3.85
4	5.11
LIC304	
1	3.34
2	0
3	0

MODE / PIN NO.	STATE
4	0
5	0
6	0
7	3.34
8	0
9	0
10	0
11	0
12	0
13	3.34
14	3.34
15	3.34
16	3.34
17	3.34
18	0
19	0
20	3.34
21	0
22	0
23	0
24	0
25	3.34
26	0
27	0
28	0
29	0
30	0
31	0
32	0
33	0
34	3.34
35	1.02
36	3.4
37	0
38	0
39	0
40	0
41	0
42	0
43	0
44	3.34
45	0
46	0
47	0
48	0
49	0
50	0
LIC501	
1	0
2	0
3	0
4	0
5	0
6	0
7	0

MODE / PIN NO.	STATE
8	0
9	0
10	0
11	3.34
12	3.34
13	0
14	0
15	0
16	0
17	0
18	0
19	0
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22	0
23	0
24	0
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33	0
34	0
35	0
36	0
37	0
38	0
39	0
40	0
41	0
42	0
43	0
44	0
45	0
46	0
47	0
48	0
LIC502	
1	0
2	0
3	12.92
4	1.68
5	1.67
6	1.7
7	1.7
8	1.7
9	1.7
10	0
11	0
12	12.92
13	0

MODE / PIN NO.	STATE
14	0
15	0
16	0
17	12.92
18	12.92
19	5.1
20	5.1
21	5.1
22	5.1
23	5.1
24	5.1
25	5.1
26	1.67
27	0
28	5.1
29	1.67
30	2.06
31	12.92
32	12.92
33	12.92
34	0
35	0
36	0
37	0
38	0
39	0
40	0
41	0
42	1.68
43	3.34
44	0
45	0
46	1.7
47	1.66
48	5.1
49	0
50	0
51	0
52	0
53	0
54	0
LIC504	
1	0
2	3.34
3	1.3
4	1.32
5	3.35
6	0
7	0
8	0
9	0
10	0
11	3.35
12	3.35
13	0.78

MODE / PIN NO.	STATE
141.27	
15	0
16	0
17	1.46
18	0
19	3.35
20	3.35
LIC505	
1	5.1
2	1.52
3	0
4	1.52
5	3.34
LIC506	
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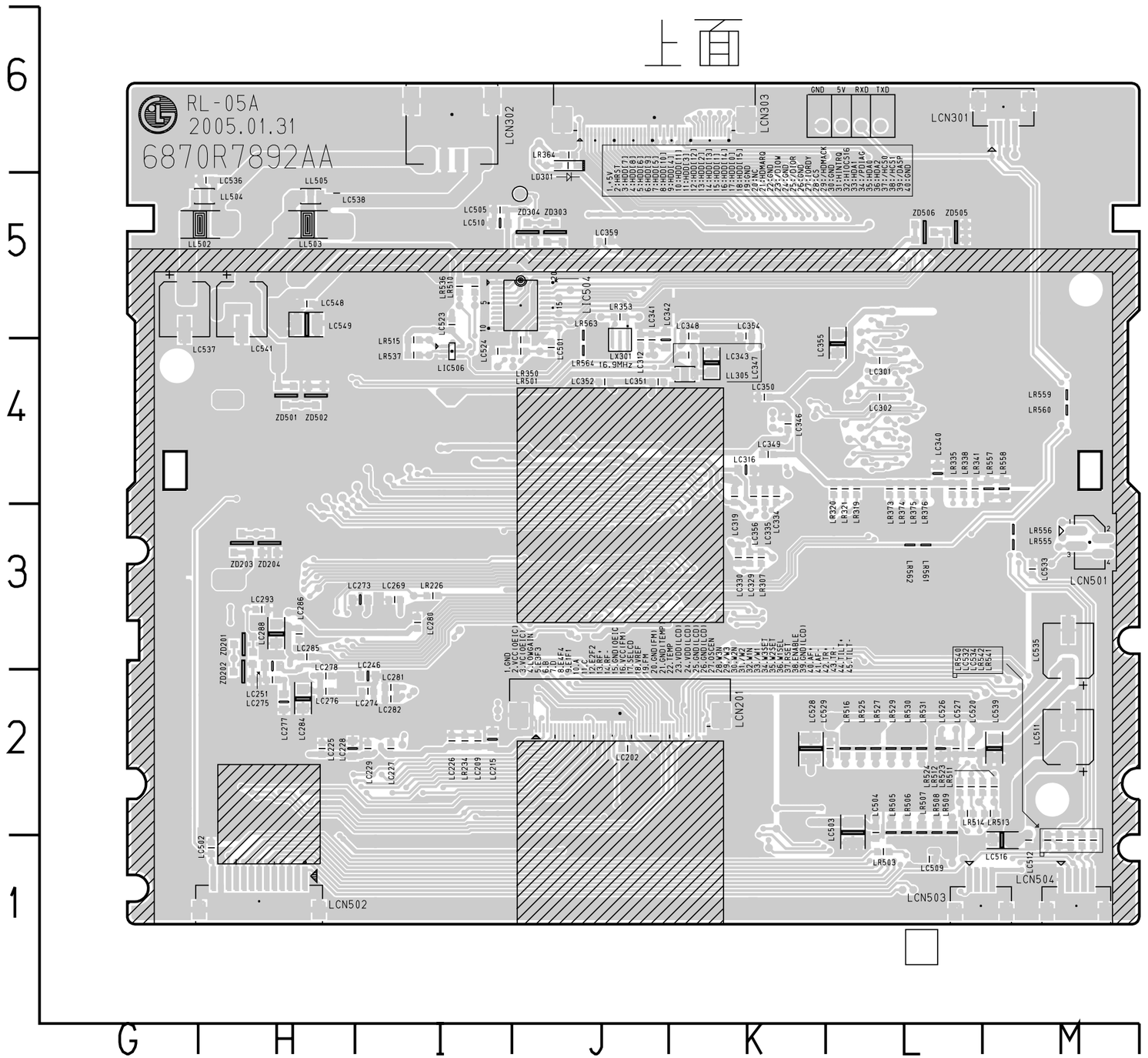
2	3.34
3	0
4	3.35
5	3.35

PRINTED CIRCUIT DIAGRAMS

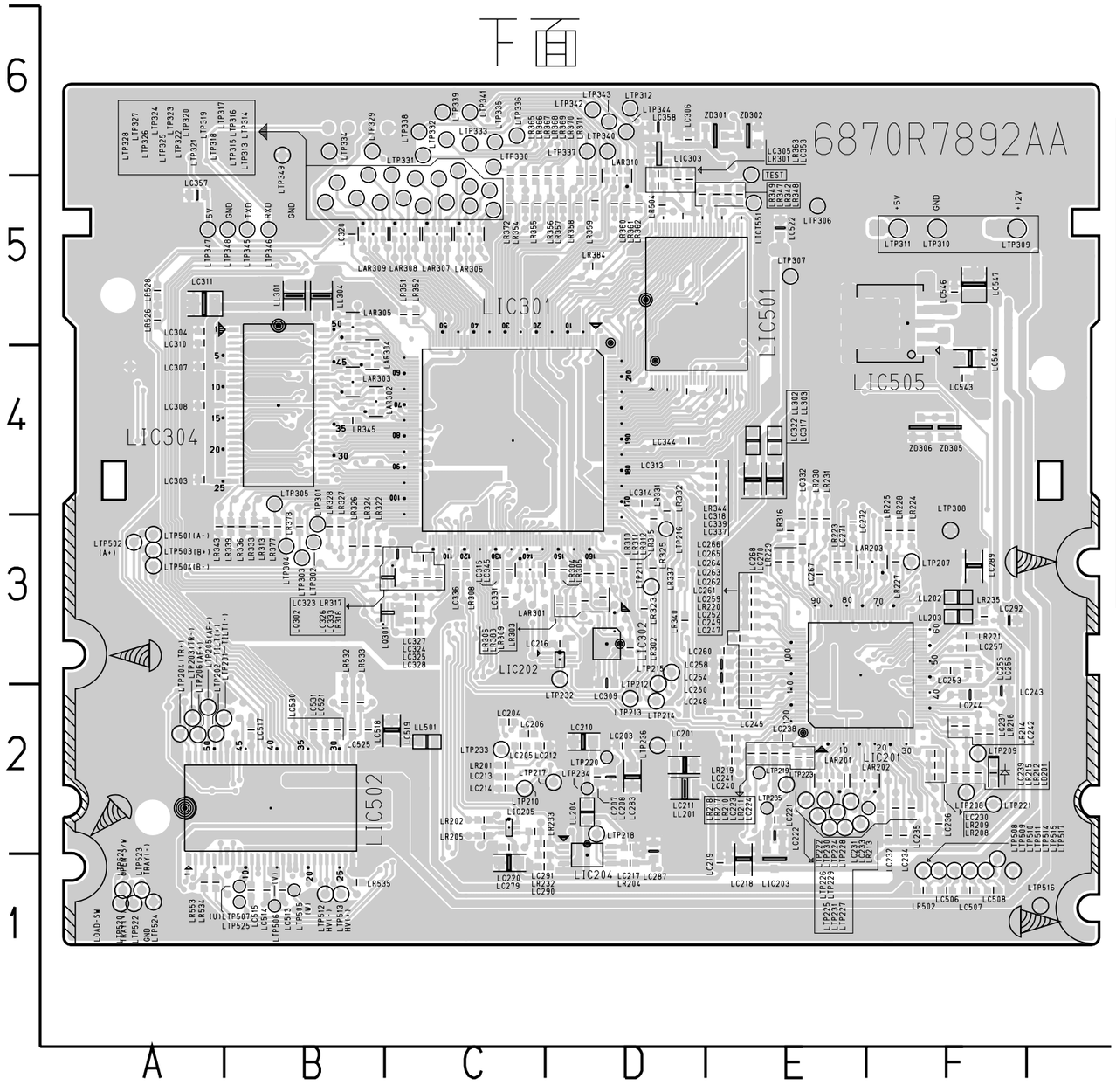
1. MAIN P.C.BOARD



LOCATION GUIDE

LC202	J2	LC343	K4	LC541	H5	LICT318	L4	LICT559	L2	LR513	M2
LC209	I2	LC346	K4	LC548	H5	LICT319	L4	LICT561	L2	LR514	L2
LC215	I2	LC347	K4	LC549	H5	LICT321	L4	LICT563	L2	LR515	I4
LC225	H2	LC348	K5	LCN201	J2	LICT324	L4	LICT566	I4	LR516	L2
LC226	I2	LC349	K4	LCN301	M6	LICT325	L4	LICT567	I4	LR523	M2
LC227	I2	LC350	K4	LCN302	I6	LICT328	L4	LICT568	J5	LR524	L2
LC228	H2	LC351	J4	LCN303	J6	LICT329	L4	LL305	K4	LR525	L2
LC229	I2	LC352	J4	LCN501	M3	LICT330	K4	LL502	H5	LR527	L2
LC246	I2	LC354	K5	LCN502	H1	LICT331	K4	LL503	H5	LR529	L2
LC251	H3	LC355	L4	LCN503	L1	LICT332	L4	LL504	H5	LR530	L2
LC269	I3	LC356	K4	LCN504	M1	LICT333	L4	LL505	H5	LR531	L2
LC273	I3	LC359	J5	LD301	J6	LICT335	K4	LR226	I3	LR536	I5
LC274	I2	LC501	J4	LIC504	J5	LICT336	L4	LR234	I2	LR537	I4
LC275	H2	LC502	H1	LIC506	I4	LICT337	K1	LR307	K3	LR540	M1
LC276	H2	LC503	L2	LICT202	J3	LICT339	K2	LR319	L4	LR541	M1
LC277	H2	LC504	L2	LICT203	I2	LICT353	K3	LR320	L4	LR542	M1
LC278	H2	LC505	I5	LICT211	I2	LICT354	K3	LR321	L4	LR555	M3
LC280	I3	LC509	L1	LICT238	H3	LICT361	K4	LR335	L4	LR556	M3
LC281	I2	LC510	I5	LICT247	I3	LICT362	K3	LR338	L4	LR557	M4
LC282	I2	LC511	M2	LICT265	I3	LICT364	K3	LR341	L4	LR558	M4
LC284	H2	LC512	M1	LICT277	H3	LICT370	J4	LR350	J4	LR559	M4
LC285	H3	LC516	M1	LICT301	L4	LICT374	J5	LR353	J5	LR560	M4
LC286	H3	LC520	L2	LICT302	L5	LICT378	J5	LR364	J6	LR561	L3
LC288	H3	LC523	I5	LICT303	L5	LICT383	J5	LR373	L4	LR562	L3
LC293	H3	LC524	I4	LICT304	L4	LICT501	J4	LR374	L4	LR563	J5
LC301	L4	LC526	L2	LICT305	L4	LICT502	I4	LR375	L4	LR564	J4
LC302	L4	LC527	L2	LICT306	L4	LICT505	L1	LR376	L4	LX301	J4
LC312	J4	LC528	K2	LICT307	L4	LICT516	L2	LR501	J4	ZD201	H3
LC316	K4	LC529	L2	LICT308	L4	LICT517	L2	LR503	L1	ZD202	H2
LC319	K4	LC532	M1	LICT309	L4	LICT526	J4	LR505	L2	ZD203	H3
LC329	K3	LC533	M3	LICT310	L4	LICT539	J5	LR506	L2	ZD204	H3
LC330	K3	LC534	M1	LICT311	K4	LICT541	J5	LR507	L2	ZD303	J5
LC334	K4	LC535	M3	LICT312	L4	LICT543	J5	LR508	L2	ZD304	J5
LC335	K4	LC536	H5	LICT313	L4	LICT545	J5	LR509	L2	ZD501	H4
LC340	L4	LC537	G5	LICT314	L4	LICT554	I5	LR510	I5	ZD502	H4
LC341	J4	LC538	H5	LICT315	L4	LICT555	I5	LR511	M2	ZD505	L5
LC342	J4	LC539	M2	LICT316	L4	LICT558	M2	LR512	L2	ZD506	L5

2. MAIN P.C.BOARD



LOCATION GUIDE

EQRF E3	LC235 F2	LC292 F3	LC518 B2	LICT220E2	LICT272D3	LICT377D4	LICT544D5	LR220 E3	LR339 B3	LR553 A1	LTP305 B4	LTP346 B5
FE E3	LC236 F2	LC303 A4	LC519 C2	LICT221F2	LICT273C3	LICT384B5	LICT546D5	LR221 F3	LR340 D3	LTP201 A2	LTP306 E5	LTP347 A5
LAR201 E2	LC237 F2	LC304 A5	LC521 B2	LICT222E3	LICT274C3	LICT385C5	LICT547D5	LR223 E3	LR342 E5	LTP202 A2	LTP307 E5	LTP348 B5
LAR202 E2	LC238 E2	LC305 D6	LC522 E5	LICT223F2	LICT275C3	LICT386C5	LICT548D5	LR224 F3	LR343 A3	LTP203 A2	LTP308 F3	LTP349 B6
LAR203 F3	LC239 F2	LC306 D6	LC525 B2	LICT224C3	LICT276C3	LICT387C5	LICT549E5	LR225 F3	LR344 E4	LTP204 A2	LTP309 F5	LTP501 A3
LAR301 C3	LC240 E2	LC307 A4	LC530 B2	LICT225F2	LICT317B4	LICT388C5	LICT550D5	LR227 F3	LR345 B4	LTP205 A2	LTP310 F5	LTP502 A3
LAR302 B4	LC241 E2	LC308 A4	LC531 B2	LICT226C2	LICT320B5	LICT389C5	LICT551E5	LR228 F3	LR347 E5	LTP206 A2	LTP311 F5	LTP503 A3
LAR303 B4	LC242 F2	LC309 D3	LC543 F4	LICT227F2	LICT322B4	LICT390C5	LICT552E5	LR229 E3	LR348 E5	LTP207 F3	LTP312 D6	LTP504 A3
LAR304 B4	LC243 F2	LC310 A5	LC544 F4	LICT228F2	LICT323B4	LICT391C5	LICT556D4	LR230 E3	LR349 D5	LTP208 F2	LTP313 C5	LTP505 B1
LAR305 B5	LC244 F2	LC311 A5	LC546 F5	LICT230E2	LICT326B4	LICT392C5	LICT557D5	LR231 E3	LR351 C5	LTP209 F2	LTP314 C5	LTP506 B1
LAR306 C5	LC245 E2	LC313 D4	LC547 F5	LICT232E2	LICT327B4	LICT393C5	LICT560B1	LR232 C1	LR352 C5	LTP210 C2	LTP315 C5	LTP507 B1
LAR307 C5	LC247 E2	LC314 D4	LD201 F2	LICT234E2	LICT334B4	LICT394C5	LICT562B2	LR233 C2	LR354 C5	LTP211 D3	LTP316 C5	LTP508 F1
LAR308 C5	LC248 E2	LC315 C3	LE E3	LICT236E3	LICT338C2	LICT395C5	LICT564B2	LR235 F3	LR355 C5	LTP212 D2	LTP317 C6	LTP509 F1
LAR309 B5	LC249 E2	LC317 E4	LIC201 E3	LICT239E3	LICT340B3	LICT396C5	LICT565B2	LR301 D5	LR356 D5	LTP213 D2	LTP318 C5	LTP510 F1
LAR310 D5	LC250 E2	LC318 E4	LIC202 D3	LICT243E3	LICT341B3	LICT397C5	LL201 D2	LR302 D3	LR357 D5	LTP214 D2	LTP319 C5	LTP511 F1
LC201 D2	LC252 E3	LC320 B5	LIC203 E1	LICT244F3	LICT342A2	LICT503A1	LL202 F3	LR303 D3	LR358 D5	LTP215 D3	LTP320 C5	LTP512 B1
LC203 D2	LC253 F3	LC322 E4	LIC204 D1	LICT245F3	LICT343D5	LICT504B1	LL203 F3	LR304 D3	LR359 D5	LTP216 D3	LTP321 C5	LTP513 B1
LC204 C2	LC254 E3	LC323 C3	LIC205 C2	LICT246E3	LICT344D3	LICT506B1	LL204 D2	LR305 D3	LR360 D5	LTP217 D2	LTP322 C5	LTP514 F1
LC205 C2	LC255 F3	LC324 C3	LIC301 C4	LICT248E3	LICT345D3	LICT513B2	LL301 B5	LR306 D3	LR361 D5	LTP218 D2	LTP323 C5	LTP515 F1
LC206 C2	LC256 F3	LC325 C3	LIC302 D3	LICT249E3	LICT346D3	LICT514B2	LL302 E4	LR308 C3	LR362 D5	LTP219 E2	LTP324 B5	LTP516 G1
LC207 D2	LC257 F3	LC326 C3	LIC303 D6	LICT250E3	LICT347D3	LICT515B2	LL303 E4	LR309 D3	LR363 D5	LTP220 D2	LTP325 B5	LTP517 F1
LC208 D2	LC258 E3	LC327 C3	LIC304 B4	LICT251E3	LICT349C3	LICT518B2	LL304 B5	LR310 D3	LR365 C5	LTP221 F2	LTP326 B5	LTP520 A1
LC210 D2	LC259 E3	LC328 C3	LIC501 D5	LICT252E3	LICT350C3	LICT519B2	LL501 C2	LR311 D3	LR366 C5	LTP222 E2	LTP327 B5	LTP521 A1
LC211 D2	LC260 E3	LC331 C3	LIC502 B2	LICT253E3	LICT351C3	LICT520B3	LQ301 C3	LR312 D3	LR367 C5	LTP223 E2	LTP328 B5	LTP522 A1
LC212 C2	LC261 E3	LC332 E3	LIC505 F5	LICT254E3	LICT352C3	LICT521B3	LQ302 C3	LR313 B3	LR368 D5	LTP224 E2	LTP329 B6	LTP523 A1
LC213 C2	LC262 E3	LC333 C3	LICT201E2	LICT255E3	LICT355B3	LICT524B3	LR201 C2	LR315 D3	LR369 D5	LTP225 E2	LTP330 C6	LTP524 A1
LC214 C2	LC263 E3	LC336 C3	LICT204D2	LICT256E3	LICT356C3	LICT525D4	LR202 C2	LR316 E3	LR370 D5	LTP226 E2	LTP331 C6	LTP525 B1
LC216 D3	LC264 E3	LC337 E4	LICT205C3	LICT257E3	LICT357C3	LICT527B3	LR204 D1	LR317 C3	LR371 D5	LTP227 E2	LTP332 C6	RRF E2
LC217 D2	LC265 E3	LC339 E4	LICT206F2	LICT258E3	LICT358C3	LICT528D4	LR205 C2	LR318 C3	LR372 C5	LTP228 F2	LTP333 C6	TE E3
LC218 E1	LC266 E3	LC344 D4	LICT207F2	LICT259E3	LICT359E4	LICT529D4	LR208 F2	LR322 B3	LR377 B3	LTP229 E2	LTP334 B6	TEST E5
LC219 E1	LC267 E3	LC345 C3	LICT208F2	LICT260E3	LICT360C3	LICT530D4	LR209 F2	LR323 D3	LR378 B3	LTP230 E2	LTP335 C6	ZD301 E6
LC220 C2	LC268 E3	LC353 D5	LICT209F2	LICT261F3	LICT363C3	LICT531E4	LR210 E2	LR324 B3	LR383 D3	LTP231 E2	LTP336 C6	ZD302 E6
LC221 E2	LC270 E3	LC357 A5	LICT210E2	LICT262F3	LICT365B3	LICT532D4	LR211 E2	LR325 D3	LR384 D5	LTP232 D3	LTP337 D6	ZD305 F4
LC222 E2	LC271 E3	LC358 D6	LICT212F2	LICT263F3	LICT366B3	LICT533E4	LR212 F2	LR326 B3	LR502 F1	LTP233 C2	LTP338 C6	ZD306 F4
LC223 E2	LC272 E3	LC506 F1	LICT213F2	LICT264F3	LICT367B3	LICT534E4	LR213 F2	LR327 B3	LR504 D5	LTP234 D2	LTP339 C6	
LC224 E2	LC279 C1	LC507 F1	LICT214F2	LICT266D3	LICT368D3	LICT535E4	LR214 F2	LR328 B3	LR526 A5	LTP235 E2	LTP340 D6	
LC230 F2	LC283 D2	LC508 F1	LICT215F2	LICT267F3	LICT369D4	LICT536E4	LR215 F2	LR331 D3	LR528 A5	LTP236 D2	LTP341 C6	
LC231 F2	LC287 D2	LC513 B1	LICT216E2	LICT268C2	LICT371B4	LICT537D5	LR216 F2	LR332 D4	LR532 B2	LTP301 B3	LTP342 D6	
LC232 F2	LC289 F3	LC514 B1	LICT217F2	LICT269D3	LICT372B4	LICT538D5	LR217 E2	LR333 B3	LR533 B2	LTP302 B3	LTP343 D6	
LC233 F2	LC290 C1	LC515 B1	LICT218E2	LICT270D3	LICT373B4	LICT540D5	LR218 E2	LR336 B3	LR534 A1	LTP303 B3	LTP344 D6	
LC234 F2	LC291 C2	LC517 B2	LICT219F2	LICT271B3	LICT376D4	LICT542D5	LR219 E2	LR337 D3	LR535 B1	LTP304 B3	LTP345 B5	